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Air Pollution Technical Information Center
Research Triangle Park, North Carolina

October 1972

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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. The subject index consists of those terms that most clearly describe the information presented in the documents. The author index consists of personal authors which are arranged alphabetically.

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AIR POLLUTION ABSTRACTS

Vol. 3, No. 10 October 1972

Prepared by:
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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INTRODUCTION

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The serial publications (journals, periodicals, etc.) which are regularly screened for input are listed with their publishers' addresses in one issue in each volume of our abstract bulletin; the most recent list appeared in the December 1971 issue.

As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching—more than those included in the subject index in each issue.

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SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry—e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development, testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

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7. EFFECTS–HUMAN HEALTH

Covers medical and epedemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS–PLANTS AND LIVESTOCK

Effects on vegetation–crops, trees, other plants–and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS–MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractural activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes, public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

22940 APTIC NO. 42627

THE NUCLEAR RESEARCH PLANT JUELICH (KFA). *(Kernforschungsanlage Juelich (KFA)). Text in German. Elektrotech. Z. B., 24(11):268- 270, 1972.*

Account is given of the research work carried out in the nuclear research plant Juelich (Northrhine Westphalia). Studies on gas cooled high-temperature reactors and the use of the high- temperature thermal energy thus obtained for the gasification of coal and other purposes are in progress. The effects of the increasing atmospheric carbon dioxide content, due to the combustion of coal and oil, on the macro-climate are studied. Problems of the disposal of radioactive wastes are investigated, and a pilot plant designed for such purposes is near completion. Biological and cytological studies on the effects of radioactivity are being carried out.

22941 APTIC NO. 42675

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrhein-Westfalen, Dusseldorf (West Germany)

CLEAN AIR FOR TOMORROW. UTOPIA OR REALITY? (Reine Luft fuer morgen. Utopie oder Wirklichkeit)? Text in German. 81p., 1972.

Trends in different branches of industry, domestic heating, and transportation and related problems involved in air-pollution control in North Rhine-Westphalia for the period ending 1985 are detailed. Air pollution control as now applied in the chemical industry is not satisfactory. While processes associated with odorous and toxic emissions will increasingly prevail, multi-stage cleaning and systematic measurements by means of recording instruments will be required. Air-pollution control at a rate of 80% will be required for new and existing plants as of 1973 and 1978, respectively. Hydrocarbon and sulfur dioxide emissions should be controlled by the petrochemical industry. The chief pollutants to be controlled in iron and steel works are carbon monoxide, dust, and fluorine compounds; and the specific dust emissions from melting furnaces should be lowered from 1.5 kg to 1.0 kg/ton of iron. Dust emissions in nonferrous metallurgy should be reduced to one third the present limit. Solids, sulfur dioxide, nitrogen oxides, and fluorine emissions from power plants should be reduced. Techniques for desulfurizing fuels and waste gases are available. Fluorine, chlorine, and sulfur compounds are the basic components of emissions from waste incinerator plants. Long-distance heating offers an ideal solution to pollution from domestic heating. The growth of transportation-generated emissions is outlined. Diesel exhaust, though containing no lead and less CO than Otto engine emissions, is nearly as harmful as the latter. Strict new standards for CO, hydrocarbon, and nitrogen oxide emissions should be implemented in 1976 (3 g of CO, 0.3 g of hydrocarbons and 0.25 g of nitrogen oxides per km).

22942 APTIC NO. 42676

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrheim-Westfalen, Duesseldorf (West Germany)

NONFERROUS METALLURGY. *(NE-Metallerzeugung). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit. Moehnesee- Wamel, West Germany, K. ron Saint George, 1972, p. 60-65.*

The present situation and future trends in the output and emissions in the nonferrous metallurgy of North Rhine-Westphalia are described. The aluminum industriy, which accounts for more than 50% of the total output of West Germany, will experience rapid growth. The basic pollutants are gaseous fluorine compounds (0.8-1.5 kg/t), aluminum- and fluorine-bearing dust (9-20 kg/t), sulfur dioxide (3-15 kg/t), and carbon monoxide. Aluminum remelting is expected to increase 100% by 1980. Chloride aerosols, metal oxides, and gaseous fluorine compounds are the chief pollutants. Dust separation at a rate of 15% was applied to rotary furnaces in 1970. Dust emissions will decrease from 1320 tons in 1970 to 680 tons in 1980 by lowering the dust concentration to 150 mg/N cu m and 100 mg/N cu m for rotary furnaces and thermal chips treatment facilities, respectively. Gaseous fluorine emissions, 90 tons in 1970, will be reduced to 50 tons in 1980 by applying wet-type gas cleaning. Sulfur dioxide emissions from lead manufacturing will be reduced 90% due to waste-gas desulfurization. The efficiency of SO2 separation at sulfuric acid production facilities is 98%. Lead and zinc emissions, amounting to 350 and 180 tons in 1970, will decrease to 50 tons each in 1975. Sulfur dioxide emissions from copper manufacturing, for which a 2% yearly rate of growth is predicted, will rise from 900 tons in 1970 to 1100 tons in 1980, the waste-gas SO2 concentration being 0.2 g/N cu m. Hydrochloric acid emissions, now 500 tons, will decrease by 50%. While total dust emission will be reduced from 600 to 300 tons, no further reduction in lead, zinc, and copper emissions is possible. The dust emissions from copper alloy manufacturing will be 10% of the 1970 level by 1980, as an upper limit of 50 mg/N cu m will be set in 1973. Sulfur dioxide emissions from zinc manufacturing, for which electrolytic processes are increasingly used, will decrease from 1800 tons in 1970 to about 1500 tons in 1980. The imposition of a maximum allowable dust emission of 50 mg/N cu m in 1973 will result in zinc and lead emissions, now 160 and 40 tons, decreasing to 80 and 20 tons, respectively, despite a growth rate of 40%.

22943 APTIC NO. 42677

Ministerium fuer Arbeits, Gesundheit und Soziales der Landes Nordrheim-Westfalen, Duesseldorf (West Germany)

STONE AND EARTH. *(Steine und Erden). Text in German. In: Reine Luft fuer morgen Utopie oder Wirklichkeit. 0Moehnesee-Wamel, West Germany, K. von Saint-George, 1972, p. 65-66*

The present situation and future trends in the stone and earth industry of North Rhine-Westphalia are described. The general growth in production, as anticipated through 1980, is characterized by a trend toward centralization and large-capacity units with resulting increased specific emissions. The basic pollutants are dust (cement and lime works), fluorine compounds (brickworks and enamel industry) as well as fluorine, chlorine, and metal oxides (glass manufacturing). No changes in the amount and composition of refractory plant emissions are expected, but the proportion of volatile and toxic components (lead, zinc, barium, fluorine, cadmium, boron, selenium, strontium, and chromium) in brickwork emissions will increase. Dust emissions from cement manufacturing plants will decrease slightly over the next few years. Strict supervision of dust separators and recording instruments for automatic dust measurements providing automatic shutoff of rotary kilns in case of emergency, should be required for cement works. High-efficiency separation of dust, fluorine, lead, zinc, and other volatile and toxic substances at brickworks, enamel processing, and wall and floor covering manufacturing plants is necessary. The need for the separation of toxic substances in glass manufacturing is emphasized.

22944 APTIC NO. 42678

Ministerium fuer Arbeits, Gesundheit und Soziales der Landes Nordrhein-Westfalen, Duesseldorf (West Germany)

THE DOMESTIC HEATING AND SMALL-SCALE INDUSTRY EMISSION SOURCE GROUP. *(Die Emittentengruppe Hausbrand und Kleingewerbe). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit. Moehnesee-Wamel. West Germany, K. von Saint George, 1972, p. 67-74.*

The problem of emissions from domestic heating and small-scale industry in North Rhine-Westphalia, as well as measures envisaged for the period ending 1980, are outlined. Aldehydes, carbon monoxide, nitrogen and sulfur oxides, hydrocarbons, including 3,4-benzopyrene, and solid particles are the basic pollutants emitted by domestic and industrial heating. Other pollutants such as solvents, aldehydes, and odorous substances are also discharged by small-scale industry (printing offices, dry cleaning shops, gasoline stations, restaurants). The demand for coal for domestic and industrial heating shows a steady decrease and 34% of all apartments are now centrally heated, with the proportion expected to increase to 50% by 1980. This will result in a considerable decrease, among others, of 3,4-benzopyrene emissions. The total volume of fuel consumed in 1969 was composed of about 28% solid fuel. 63% fuel oil and 9% gas; the respective proportions in 1980 will be 9%, 75%, and 16%. Emissions of solids have decreased considerably over the last years, while SO2 emissions abated slightly. Despite increased fuel consumption, the SO2 level in 1980 will equal the 1970 value, but decline steadily thereafter. It will be possible to reduce the fuel-oil sulfur content to 0.3% by 1980. Low-smoke solid fuel or improved heating equipment will be required as of 1973/1974. Long-distance heating, which should be required for all new housing projects, can reduce the total emission to 10%. Systematic supervision of heating equipment will be required. Charcoal filters for dry cleaning facilities must be applied, and necessary chimney heights for other equipment, particularly drying furnaces, are specified. Emission standards for various small-scale industries will be elaborated before long.

22945 APTIC NO. 42679

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrheim-Westfalen, Duesseldorf (West Germany)

TRAFFIC AS AN EMISSION SOURCE. *(Die Emittentengruppe Verkehr). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit. Moehnesee-Wamel, West Germany, K. von Saint- George, 1972, p. 78-81.*

Trends in transportation generated air pollution in North Rhine- Westphalia are outlined. Railroad traffic, consuming about 1.5 million tons of coal and some 0.6 million tons of fuel and Diesel oil in 1969, is minor pollution source, and a steady decrease in railroad emissions is expected. While pollution due to ships continues to be negligible, that due to air traffic is increasing rapidly. The traffic-generated air pollution is primarily due to road traffic. Automotive emissions will not increase at a rate corresponding to the expected increase in the number of vehicles because the intensity of use will decrease. While the standards imposed in 1971 resulted in a relative decrease in carbon monoxide and hydrocarbon emissions, a slow increase in CO and a higher increase in hydrocarbon emissions, as well as disproportionately high rise in nitrogen oxides emissions are expected. By the end of the decade CO and hydrocarbon emissions will be at their 1970 levels. The lead content of gasoline, set at 0.4 g/l as of 1972, will be further reduced to 0.15 g/l in 1976. As the present emission standards, except for those on lead, are not satisfactory, further standards requiring 80% reduction as against the 1971 level, should be introduced as of 1976 (3 g of CO, 0.3 g of hydrocarbons, and 0.25 g of nitrogen oxides per km). These should be followed by an additional reduction of 35% as of 1980.

22946 APTIC NO. 42680

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrheim-Westfalen, Duesseldorf (West Germany)

THE EMISSION SOURCE INDUSTRY GROUP CHEMISTRY. *(Die Emittentengruppe Industrie). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit. Moehnesee-Wamel, West Germany, K. von Saint-George, 1972, p. 14-26.*

The problem of chemical plant emissions and the necessary measures to be taken during the period ending 1985 are outlined. The chief pollutants emitted by the plants are organic vapors and gases (hydrocarbons and their halogen derivatives, aldehydes, ketones, organic acids, amines, mercaptans, and disulfides), inorganic vapors and gases such as hydrogen sulfide, sulfur dioxide, hydrochloric acid, fluorine compounds as well as toxic dusts of carbides, fluorides, ferroalloys, arsenic, and asbestos. The pollution-control techniques presently applied in the chemical industry may be inadequate to control emissions from new processes. In addition, the rate of growth in production is highest for products involving high emissions, partly of odorous substances. An 80% reduction in emissions from new and old facilities as of 1973 and 1978, respectively, will be required in plastic and synthetic fiber processing, and will apply to old and new pesticides manufacturing plants alike as of 1973. Adoption of the double-contact process in sulfuric acid production reduced SO2 emissions by about 85% decrease in sulfur dioxide emissions, while the nitrogen oxide emission abatement in nitric acid manufacturing due to catalytic hydrogen reduction was 88%. Guidelines regarding emission abatement in chemistry are presented. Odorous and toxic discharges should undergo multistage treatment.

22947 APTIC NO. 42681

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrhein-Westfalen, Duesseldorf (West Germany)

MINERAL OIL AND PETROLEUM PROCESSING. *(Mineraloel und Petrochemie). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit. Moehnesse-Wamel, West Germany, K. von Saint-George, 1972, p. 26-31.*

Emission problems and measures envisaged in petroleum processing and petrochemistry in the period ending 1985 are outlined with regard to North Rhine-Westphalia. The output of petroleum processing in West Germany totaled 120 million tons in 1970, and the share of North Rhine-Westphalia was 32.9%. Petroleum will make up 80% of all energy sources in 1980. Sulfur dioxide and hydrocarbon gases and vapors, emitted partly due to leakage, are the basic pollutants in petroleum processing and petrochemistry. The processing losses account for 0.4-1%, and direct emissions may be about 0.08%. The torch efficiencies range from 50-70%. While emissions from petroleum processing and petrochemical plants are comparable, torch losses are higher in the latter. Intermittent operation, characteristic of many similar facilities, may result in emission peaks. Sulfur dioxide emissions from the Claus process, representing some 3% of the total refinery SO2 emission at 93% conversion rate, will be further reduced by successively increasing the conversion rate to 94.5% in 1975 and to 95.4% in 1980. Measures for reducing organic emissions due to leakage, expansion, and incomplete combustion in the torch and handling are reviewed. High torches should be replaced by low torches with combustion temperatures above 1100-1200 C.

22948 APTIC NO. 42682

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrhein-Westfalen, Duesseldorf (West Germany)

IRON AND STEEL. *(Eisen und Stahl). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit.*

Moehnesee-Wamel, West Germany, K. von Saint-George, 1972, p. 32-37.

Future trends, air pollution problems, and related measures envisaged for the period ending 1985 in iron and steel manufacturing in North Rhine-Westphalia are outlined. North Rhine- Westphalia is responsible for 70% of the total steel output of West Germany, and further growth is expected. Thomas steel will be fully and Siemens-Martin steel largely replaced by oxygen converter steel by 1980. Dust emissions from ore yards should be controlled. Sintering plants, emitting toxic metal oxides and fluorine and chlorine compounds, should be equipped with proper pollution control equipment. While blast furnaces, discharging dust, carbon monoxide, nitrogen oxides, sulfur dioxide, and hydrogen sulfide, will prevail during the rest of the decade, processes for direct reduction have been developed. The toxic oxides emitted by oxygen converters call for wet dust separators, electrostatic, and continuously operating tissue filters. The present emission standards should be replaced by stricter ones, and excess-air coefficients of 0.3-0.1 should be applied to abate CO emissions. Electric arc furnaces using the ultra-high-power technique should be covered by total dust separation. A limit value of 50 mg/N cu m and the use of tissue filters should be required. Open-hearth furnaces still in use after 1976 should be equipped with dust separators. The recycling of nontreated dust, containing iron and toxic or volatile compounds of lead, cadmium, zinc, arsenic, manganese, copper, antimony, chromium, and fluorine, should be abandoned. The shutdown of obsolete facilities and improvements in pollution-control techniques are further necessary measures. Special attention should be paid to controlling emissions from ore yards, sintering plants (where combined desulfurization and defluorination techniques should be adopted), oxygen converters, and blast furnaces. Total dust separation in steel mills should be applied.

22949 APTIC NO. 42683

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrhein-Westfalen, Duesseldorf (West Germany)

IRON AND TEMPERING FOUNDRIES. *(Eisen- und Tempergiessereien). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit, Moehnesee-Wamel, West Germany, Verlag K. von Saint- George, 1972, p. 38-40.*

The present situation and future trends for a period ending in 1980 in the output and emissions of iron and tempering foundries in North Rhine-Westphalia are described. The iron and tempering foundries in North Rhine-Westphalia now account for 44% of the total production volume in West Germany; their growth is expected to slow down during the next decade. The basic pollutants emitted by foundries are dust, sulfur dioxide, and gaseous fluorine compounds, and melting furnaces as well as mold preparation represent the chief emission sources. The maximum allowable specific dust emission from melting furnaces will be lowered from 1.5 to 1.0 kg/t of iron by 1980. New furnaces can be now provided with total dust separation, and the proportion of such furnaces is expected to rise to 20% by 1980. Cupola furnace throat gases contain, on an average, 700 ppm of SO2, corresponding to a specific emission of 1.6 kg/t. A decrease of about 33% in SO2 emission by 1980 can be expected, as coke will be increasingly replaced by natural gas and electricity. The gaseous fluorine emissions are due to fluorine contents in coke (20 ppm) and in dolomite and lime (about 100 ppm). While the fluorine emissions (less than 10 t/year are relatively low), separation techniques with a minimum efficiency of 90% are available. A further decrease in fluorine emissions due to the decreasing proportion of basic hot-blast cupola furnaces is predicted.

22950 APTIC NO. 42684

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrhein-Westfalen, Duesseldorf (West Germany)

WOOD PROCESSING INDUSTRY. *(Holzindustrie). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit, Moehnesee- Wamel, West Germany, K. von Saint George, 1972, p. 51-52.*

The present situation and future trends in output and emissions in the wood-processing industry of North Rhine-Westphalia are outlined. The rate of growth in production will be some 60% by 1980. Wood and plastic dusts are the chief pollutants, while nuisances due to aldehydes are negligible. Dust emissions, amounting to some 2000 tons in 1970, will be 4000 tons in 1980, if present dust-separation techniques are applied. Coarse dust is separated in cyclones, and tissue filters are applied to fine dust down to 0.5 micron. It will be possible to reduce dust emissions to 1500 tons by 1975 by applying proper transport and handling equipment, high-performance cyclones, or filter separators. These measures should be adopted for new and old facilities in 1973 and 1975, respectively.

22951 APTIC NO. 42685

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrhein-Westfalen, Duesseldorf (West Germany)

POWER PRODUCTION. *(Energieerzeugung). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit, Moehnesee-Wamel, West Germany, K. von Saint-George, 1972, p. 40-51.*

Trends in fuel use by thermal power plants and industry in North Rhine-Westphalia and resulting changes in emissions (solids, sulfur dioxide, nitrogen oxides, and gaseous fluorine compounds) are described. Assuming no further improvements in air-pollution control techniques, emissions of solids will increase by 12.5% by 1985, the share of power plants rising from 65% to 72%. Fuel oil will account for 23% of all energy sources. 60-73% increase in nitrogen oxides emissions from 1969 to 1985 is expected, but the contribution of power plants and industry will remain about the same. Sulfur dioxide emissions will increase by 75% from 1.2 million tons in 1969 to 2.1 million tons in 1985. While the proportion of brown coal will be unchanged, it will be consumed almost exclusively by power plants, and the increase in fuel-oil consumption will be most important in industry. Fluorine emissions will be up 17% from 7500 tons in 1969 to 8800 tons in 1985. The contribution of power plants to total fluorine emissions will rise from 84% to 93% as a result of increased brown coal consumption. Optional emission-control measures with regard to solids, SO2, and fluorine emissions are suggested. As dust emission standards are violated as a consequence of continuous operation, the installation of automatic measuring instruments may be necessary. A specific emission of 0.6 kg/ton of heavy oil should be reached by applying centrifugal dust separators, while the dust emission standards for coal firings should be lowered to 50-100 mg/N cu m. In 1969, 64% of the heavy oil consumed contained less than 1% sulfur; in 1985, the proportion of heavy oil with 0.46% S will be 40%. Waste gas desulfurization, resulting in an 80% decrease, will be applied as of 1974, and appropriate means for desulfurizing fuels are available. The total reduction in SO2 emissions by 1985 will be some 30%. Fluorine emissions are expected to decrease from 7500 to 4600 tons in 1985 by 25%. The efficiency of wet separation techniques and alkaline absorbents is 80%.

22952 APTIC NO. 42744

Hittman Associates, Inc., Columbia, Md.

ELECTRICAL POWER SUPPLY AND DEMAND FORECASTS FOR THE UNITED STATES THROUGH 2050. *Office of Air Programs Contract EHSD 71-43, HIT-498, 54p., Feb. 1972. 21 refs.*

NTIS: PB 209266

Total installed power capacity will increase from about 320,000 MW in 1970 to about 1 million MW in 1990, about 1.5 million MW in 2000, and 5.2 million MW in 2050. Fossil fuel use will decrease to about 50% in 2000 and to about 11% in 2050, while nuclear power will increase from the present 3% to about 45% in 2000 and to about 88% in 2050. Hydroelectric power shows

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a gradual increment throughout the forecast period but provides a consistently smaller percentage of total power capacities. In arriving at these forecasts, basic assumptions have been made, including the assumption that breeder reactors will be available around 1985, and that plant load factors will steadily improve through improved systems technology. Trend analysis and extrapolation has been used to predict longer-term power requirements. Research in the area of per capita usage is needed.

22953 APTIC NO. 42748

Pollution Research and Control Corp., Glendale, Calif.

SUMMARY REPORT ON AIR POLLUTION EMISSION INVENTORY FOR THE STATE OF IDAHO. *Environmental Protection Agency Contract 68-02-0045, 66p., Sept. 1971. 16 refs.*

NTIS: PB 204190

An emissions inventory for the State of Idaho, covering particulates, sulfur dioxide, carbon monoxide, hydrocarbons, and oxides of nitrogen, is presented. The five major sources of such emissions included in this inventory are fuel combustion, process losses, solid waste disposal, transportation, and miscellaneous sources. The methodology of developing emission data from the information obtained by questionnaires and personal contacts is considered. Allowable emissions for suspended particulates and sulfur dioxide were calculated for the existing Idaho air pollution regulation and the Model Regulation contained in the Federal Register.

22954 APTIC NO. 42751

Kearney (A. T.) and Co., Inc., Chicago, Ill.

AIR POLLUTION ASPECTS OF THE IRON FOUNDRY INDUSTRY-FEBRUARY, 1971. *Air Pollution Control Office Contract CPA 22-69-106, 156p., Feb. 1971. 18 refs.*

NTIS: PB 204712

Despite recent advancements in the technology of making iron castings, the cupola is still the predominant melting unit employed in the iron foundry industry. Emissions from the industry include metallic oxides, oil vapors, and carbon monoxide from melting furnace operations; from other dust-producing operations come sand fines, metal dust, and coke dust. Odors and gaseous compounds such as fluoride fumes, vapors, and facing fumes come from both sources. The lack of correlation between standard furnace design factors and emissions levels requires that the explanation for the wide variance in type and quantity of emissions lie with cupola operating factors, rather than cupola design. Operating factors are broken down into two distinct groups: methods of operations, such as blast rate and temperature, type of lining, and operating variables of the afterburner; and the quality of charge materials, including metal to coke ratio, use of oxygen or natural gas, and the use of briquettes. Recommended practices for testing particulate emissions from cupolas are also included. Control devices include centrifuges, scrubbers, fabric filters, afterburners, preheaters, electrostatic precipitators, furnace hoods, and ventilation.

22955 APTIC NO. 43267

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

MOBILE COMBUSTION SOURCES. *In: Compilation of Air Pollutant Emission Factors. OAP Pub-AP-42, p. 3-1 to 3-14, Feb. 1972. 31 refs.*

NTIS: PB 109559

Mobile combustion sources -- gasoline-powered motor vehicles, diesel-powered motor vehicles, aircraft, and river vessels (steamships, motor ships, and gas turbine-powered ships), are discussed. Emission factors for these sources are presented. Gasoline-powered vehicles are in the categories of passenger cars, light-duty trucks, and gasoline-powered heavy-duty vehicles. Diesel-powered vehicles include heavy-duty trucks, buses, and locomotives. Emissions from motor vehicles come from exhaust, crankcase blowby, and evaporation from the fuel tank and carburetor; they consist of hydrocarbons, carbon monoxide, nitrogen oxides, and particulates. Aircraft engines and river vessels are generally described. Detailed emission data are given for both.

22956 APTIC NO. 43268

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

EVAPORATION LOSS SOURCES. *In: Compilation of Air Pollutant Emission Factors. OAP Pub-AP-42, p. 4-1 to 4-6, Feb. 1972. 17 refs.*

NTIS: PB 209559

Evaporation losses and their sources are discussed. General processes in dry cleaning, surface coating, petroleum storage, and gasoline marketing are described. Hydrocarbon emission factors are given for petroleum solvents and synthetic solvents in dry cleaning operations; paint, varnish and shellac, lacquer, enamel, and primer (zinc chromate) for surface-coating applications; and for breathing and working losses from the storage of petroleum products. The emissions associated with gasoline marketing are primarily vapors expelled from a tank by displacement as a result of filling. Controls are mentioned.

22957 APTIC NO. 43269

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

CHEMICAL PROCESS INDUSTRY. *In: Compilation of Air Pollutant Emission Factors. OAP Pub-AP-42, p. 5-1 to 5-26, Feb. 1972. 65 refs.*

NTIS: PB 209559

Emissions from the manufacture and/or use of chemicals or chemical products are reviewed. Emissions are primarily gaseous and are controlled by incineration, adsorption, or absorption. Estimates of emission factors are based on material balances, yields, or similar processes. Process descriptions are given for: adipic acid, ammonia, carbon black (channel black, furnace and thermal black processes), charcoal, chlor-alkali, explosives (TNT and nitrocellulose), hydrochloric acid, hydrofluoric acid, nitric acid, paint and varnish, phosphoric acid, phthalic anhydride, plastics, printing ink, soap and detergents, sodium carbonate, sulfuric acid, synthetic fibers, synthetic rubber, and terephthalic acid. Significant emissions and control methods are given for the processes.

22958 APTIC NO. 43270

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

FOOD AND AGRICULTURE INDUSTRY. *In: Compilation of Air Pollutant Emission Factors. OAP Pub-AP-42, p. 6-1 to 6-15, Feb. 1972. 40 refs.*

NTIS: PB 209559

Food and agricultural product processing, including refining, preservation, product improvement, storage and handling, packaging, and shipping are reviewed. Particulate emission factors are given for: alfalfa dehydrating, coffee roasting, cotton ginning, grain handling and processing, fermentation, fish processing, meat smokehouses, nitrate fertilizers, phosphate fertilizers, starch manufacturing, and sugar cane processing. Control methods include the use of: baghouses, afterburners, cyclones, activated-carbon adsorbers, scrubbers, and electrostatic precipitators. Particulates, carbon monoxide, hydrocarbons, nitrogen oxides, fluorides, ammonia, aldehydes, hydrogen sulfide, organic acids, and amines are some of the pollutants emitted from food and agriculture industries.

22959 APTIC NO. 43271

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

METALLURGICAL INDUSTRY. *In: Compilation of Air Pollutant Emission Factors. OAP Pub-AP-42, p. 7-1 to 7-22, Feb. 1972. 61 refs.*

NTIS: PB 209559

Primary and secondary metal industries are discussed. The primary industries, producing metals from ore, reviewed are: non-ferrous operations of aluminum ore reduction, copper smelters, lead smelters, zinc smelters, iron and steel mills, ferroalloy production, and metallurgical coke manufacture. Large quantities of sulfur oxides and particulates are emitted by these industries. The secondary metallurgical industries, which recover metal from scrap and salvage and produce alloys from ingot, include aluminum operations, brass and bronze ingots, gray iron foundries, lead smelting, magnesium smelting, steel foundries, and zinc processing. The major air contaminants from these operations are particulates in the forms of metallic fumes, smoke, and dust. Control methods used are: cyclones, electrostatic precipitators, filters, and baghouses.

22960 APTIC NO. 43272

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

MINERAL PRODUCTS INDUSTRY. *In: Compilation of Air Pollutant Emission Factors. OAP Pub-AP-42, p. 8-1 to 8-24, Feb. 1972. 72 refs.*

NTIS: PB 209559

Processing and production of various minerals are discussed. Particulate emission factors are given for: asphalt batching, asphalt roofing, brick and clay product manufacturing, calcium carbide manufacturing, castable refractories manufacturing, cement manufacturing, ceramic clay manufacturing, clay and fly-ash sintering, coal cleaning, concrete batching, fiberglass manufacturing, frit manufacturing, glass melting, gypsum processing, lime manufacturing, mineral wool processing, perlite manufacturing, phosphate rock processing, and stone quarrying and processing. Emissions occur during processing and throughout handling and storage. Control equipment used includes cyclones, scrubbers, and fabric filters. Particulates, carbon monoxide, hydrocarbons, sulfur oxides, nitrogen oxides, and fluorides are the major pollutants.

22961 APTIC NO. 43273

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

PETROLEUM INDUSTRY. *In: Conpilation of Air Pollutant Emission Factors. OAP Pub-AP-42, p. 9-1 to 9-4, Feb. 1972. 1 ref.*

NTIS: PB 209559

Petroleum refining processes are divided into four steps: separating, converting, treating, and blending. The unit operations discussed are: crude oil distillation, moving bed and fluidized bed catalytic cracking, catalytic reforming, polymerization, alkylation, isomeration, treating, and blending. The most important factors affecting emissions are crude oil capacity, air pollution control equipment used, general level of maintenance, and processing scheme used. Pollutants emitted are: sulfur oxides, nitrogen oxides, hydrocarbons, carbon monoxide, malodorous materials, particulates, aldehydes, ammonia, and organic acids.

22962 APTIC NO. 43274

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

WOOD PROCESSING. *In: Compilation of Air Pollutant Emission Factors. OAP Pub-AP-42, p. 10-1 to 10-5, Feb. 1972. 10 refs.*

NTIS: PB 209559

Wood pulping operations for the manufacture of pulp, paperboard, and fiber board are discussed. The kraft process of wood pulping and pulp board production processes are described. Major emissions are particulates, sulfur dioxide, carbon monoxide, and hydrogen sulfide. Control methods used are electrostatic precipitators, scrubbers, and venturri scrubbers.

22963 APTIC NO. 43289

Environmental Engineering, Inc., Gainesville, Fla.

BACKGROUND INFORMATION FOR ESTABLISHMENT OF NATIONAL STANDARDS OF PERFORMANCE FOR NEW SOURCES: PULP AND PAPER INDUSTRY. *Environmental Protection Agency, Div. of Abatement Contract CPA-70-142, Task Order 2, 98p., March 15, 1971. 44 refs.*

The important atmospheric emissions from the pulp and paper industry result from the chemical production of pulp. The kraft process is used to produce 75% of the domestic tonnage of paper pulp. Valid information on emissions is sparse due to the slow development of analytical hardware. The kraft process is notorious for its air pollution control difficulties. Emissions of the reduced sulfur gases, hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide occur during nearly every phase of the kraft process. Digesters and multi-effect evaporators are the largest sources. It is estimated that the most up to date mill equipped with the control systems available would pay $1.25/air dried ton of pulp and conform to very strict emission requirements. Standards for new mills are set for each of the procedures in the kraft process. No standards can be set for other processes because of the scarcity of data. The conversion cost for older mills is thought to be prohibitive.

22964 APTIC NO. 43314

Ministry of Health and Welfare (Japan), Dept. of Environmental Pollution Control

REFERENCE DATA FOR THE PURPOSE OF DECISION OF ENVIRONMENTAL STANDARD FOR CONTROLLING AIR POLLUTION BY CARBON MONOXIDE. *(Issankatanso ni yoru taiki-osen boshi no tame no kankyo-kijun no settei ni tsuite (Sanko shiryo)). Text in Japanese. 24p., Dec. 1969.*

Changes in the total number of motor vehicles in the main countries of the world and in Japan are described. Road width, fuel consumption, and number of motor vehicles per area of inhabitable land are mentioned. Engine exhausts arising from burning petroleum fuel are described. Sources and amounts of exhausted carbon monoxide/day at four areas in the State of California are given. Values of exhaust gases from motor vehicles are estimated for the future. Carbon monoxide control and monitoring are mentioned. The actual situation of short-term investigations of CO in Japan is described. The CO concentration was measured by non-dispersive infrared analysis in Japan. Carbon monoxide pollution in the United States and Japan are mentioned. The volume of traffic and the concentration of carbon monoxide are correlated. Comparisons are given of the maximum permissible concentration of carbon monoxide in ambient air in the countries of the world.

22965 APTIC NO. 43397

Bureau of Mines, Mineral Supply

UNITED STATES COAL RESOURCES AND PRODUCTION. *50p., June 1971. 59 refs.*

NTIS: PB 2022166

Data are compiled on the total remaining coal resource of the United States and the production of coal in 1970 by mining method, sulfur content, ash content, and BTU value. Production of all coal has been projected to 1976. Projections have also been made in three sulfur categories: less than 1.0%, 1.0% to 2.0%, and 2.1% or more sulfur. The total remaining coal resource of the United States, as of December 31, 1970, was estimated at 1576 billion tons, consisting of 693 billion tons of bituminous coal, 420 billion tons of subbituminous coal, 447 billion tons of lignite, and 16 billion tons of anthracite. All of the subbituminous coal and most of the lignite occurs west of the Mississippi River; 28% of the bituminous coal and 3% of the anthracitie also occurs west of the Mississippi River. In 1970, 599 million tons of coal was produced in the United States. Sixty-one percent of the production came from underground mines, 36% from strip mines, and 3% from auger mines. Ninety-two percent of the total production was produced in states east of the Mississippi River. Production from the eastern states accounted for 97% of the coal mined underground, 85% of the strip-mine coal, and virtually all of the augered coal produced in the nation. Projections of coal production by 1976 indicate an increase of about 23% for total coal and about 24% for coal with 1.0% or less sulfur content. Possible constraints on increasing production include legislation controlling air pollution, the availability of labor, adequacy of transportation, and the new Federal Coal Mine Health and Safety Act of 1969. Technical limitations are also factors that will affect future production. (Author abstract modified)

22966 APTIC NO. 43399

TRC, The Research Corp. of New England, Hartford, Conn.

AIR POLLUTANT EMISSION INVENTORY STATE OF MINNESOTA AIR QUALITY DIVISION. *Environmental Protection Agency Contract 68-02-0047, Task 1, Rept. 4280, 60p., Oct. 1971. 33 refs.*

NTIS: PB 203902

Emission inventory data were collected to provide specific information appropriate to the calendar year 1970 on area and point sources for five air pollutants: particulates, sulfur oxides, carbon monoxide, hydrocarbons, and nitrogen oxides. The overall methodology employed centered on correctly apportioning various types of fuels, process emissions, and combustible solid waste. Totals for all types of emissions sources were determined from the tabulated sources. The fuels and solid waste were apportioned according to population and applicable land use variables in each region. Once subtotals had been established for fuels and solid waste for the seven Air Quality Control Regions in the area, the quantities reported by point source questionnaires were subtracted resulting in the quantities of fuel that would be available for area source apportioning. Specific source types whose emissions contribution to each of the seven regions was estimated were coal, residual and distillate oil, natural and bottled gas, domestic and other wood burning, open burning and incineration, solvent evaporation, diesel vessels, railroads, diesel motor vehicles, gasoline motor vehicles, and gasoline evaporation. For each source type specific methods of estimation are described.

22967 APTIC NO. 43404

National Industrial Pollution Control Council, Washington, D. C., Electric and Nuclear Sub-Council

AN EVALUATION OF THE APPLIANCE X-RAY POLLUTION PROBLEM. *32p., June 1971. 17 refs.*

GPO

The X-ray pollution problem from television and medical and dental X-ray equipment is discussed. Somatic and genetic damage of human body cells is considered. Improvements in the design of facilities and equipment, and refinements of radiological techniques in collimation and alignment, filtration, the shielding of X-ray housing, calibrated measuring devices and labeled controls, image recording, and fluoroscopy are reviewed. Controls to minimize X-ray levels and X-ray protection standards are presented.

22968 APTIC NO. 43623

THE INDUSTRIAL ASPECTS OF AIR POLLUTION. *Steam Eng., 24(280): 133-136, Jan. 1955.*

A brief report is presented on the Conference held by the Combustion Engineering Association at Harrogate England on December 8 and 9, 1954, to discuss the industrial implications of the Beaver Report. The Conference was attended by 200 delegates representing fuel users, fuel distributors, appliance makers, and the fuel industries. Special emphasis was placed on the industrial smoke problem; it was suggested that model regulations were needed by local authorities in regard to smoke prohibition. Air pollution problems were also discussed in relation to the operation of foundries, the manufacture of bricks and pottery, and the manufacture of cement. The difficulties faced by a small industry that is attempting to reduce its contributions to air pollution were elucidated and recommendations were given.

22969 APTIC NO. 43626

Andersson, Kjell

METHODS FOR REDUCING TOTAL SULPHUR EMISSION TO ATMOSPHERE FROM A SULPHATE MILL. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 2:41-2:52. (Sept. 1-6.)*

Sulfur emission from sulfate mills and methods to reduce sulfur emissions are discussed. Emissions from sulfate mills include hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, and sulfur dioxide. Four cases of sulfate mill production procedures are presented. To reduce sulfur compound emissions, the following procedures are recommended: installation of a deodorizing system, reducing alkali losses, absorption with sodium hydroxide in a scrubber, and recycling of sulfur dioxide.

22970 APTIC NO. 43460

Bacalu, Ph. and G. Bruzzone

A STUDY OF THE PRINCIPAL CHARACTERISTICS OF A HIGH POWERED CARBIDE FURNACE. *(Etude des caracteristiques principales d un four a carbure de grande puissance). Intern. Electrowarme-Kongr., 5(101), 8p., 1963. Translated from French. 19p.*

A plant for the production of calcium carbide as well as production of ferroalloys was installed in 1954 at Langerbrugge, Belgium. Electro-thermal production of the factory at present is as follows: calcium carbide, standard ferro-magnesium, silico-manganese, and refined ferro-manganese. Since 1954 six furnaces have been installed; one of which is a completely closed fixed furnace of 30 MVA for the production of calcium carbide. The layout of the factory and the technical and economic reasons for its siting, the handling of raw materials and the preparation of the loads, and the casting and treatment of calcium carbide are discussed. The central thermal plant feeds with a voltage of 12 KV-50 Hz all the furnaces with the exception of the closed calcium-carbide furnace which is supplied with a voltage of 36 KV-50Hz and has an output constant between 251.9 V and 180.7 V. The construction of the 30 MVA electrical furnace included a series of instruments for measuring temperature, pressure, composition and outflow of gas products, as well as auxiliary apparatus for testing irregularities in the functioning of the installation. The arrangement of the metal-vault furnace makes possible remote control of the slippage and recovery operation of the electrode and permits operation initiation with the furnace partially closed, thus facilitating the starting up of the installation. A description of the commissioning of the installation, the metallurgical conditions of its working, the characteristics of raw materials, and the resulting performance is included.

22971 APTIC NO. 42905

Barthelemy, Robert R.

POLLUTION CONTROL USING ADVANCED ENERGY GENERATION SYSTEMS. *Advan. Astronaut. Sci. Suppl. vol. 26:1-5, 1971. 6 refs. (Presented at the American Astronautical Society and the American Institute of Aeronautics and Astronautics, Special Technical Event, Winrock, Ark. Oct. 30, 1970. Paper AAS70-070.)*

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The three most important forms of pollution are thermal water pollution, chemical air pollution, and to a lesser degree, the introduction of nuclear and chemical wastes into the soil. This adverse situation arises primarily because it is impossible to convert all of the latent energy of chemical and nuclear fuels into desirable directed energy. The only technological recourse is to minimize the contaminating effects of the major conversion processes. Recent developments in the fields of high temperature energy sources and advanced energy conversion processes could be used to improve the processes used for generating electrical power. The use of high temperature nuclear reactor thermal systems, coupled to high efficiency generation systems, could reduce the thermal pollution of generation plants several-fold and completely eliminate particulate pollution of the atmosphere, with little or no contamination with nuclear by-products. Two technical areas being pursued by the Air Force are applicable. Gaseous core nuclear reactors are being studied in basic and exploratory development for future space rocket uses. However, such a system could produce a power generation system working fluid at 4000 K. Exploratory development of magnetohydrodynamic generators for airborne and space system power has shown high efficiency operation if high temperature gases are used. Coupled to 4000 K gases, these generators could convert 60-70% of the gas thermal energy into electrical power. This efficiency is 50% higher than the most modern advanced steam turbine plant and over 100% more efficient than conventional nuclear power plants. The amount of thermal pollution would be reduced by a factor of 3 to 5. The decreased cost of electrical power through improved efficiency operation would result in a savings of about $1 billion/yr at the present consumption rate. (Author abstract modified)

22972 APTIC NO. 43543

Berggren, Hans

EXPERIENCES AND FUTURE PROSPECTS -- SOME POINTS OF VIEW FROM THE POWER PRODUCERS. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 3:50 to 3:67. (Sept. 1-6.)*

The electric power industry s energy consumption is reviewed. Current types of power stations, including water power, atomic power, combined power and heating plants in towns, conventional condenser power, counterpressure power, and peak power, and their energy production distribution are listed. Effects on the environment of the existing and future size of the production apparatus and its emissions of sulfur dioxide, dust, nitrogen oxides and noise are discussed.

22973 APTIC NO. 42916

Darley, Ellis F., Harold H. Biswell, George Miller, and John Goss

AIR POLLUTION FROM FOREST AND AGRICULTURAL BURNING. *Preprint, Combustion Institute, Western States Section, 10p., 1972. 5 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72- 11.)*

The increasing use of prescribed fire in forest management and the continuing burning of agricultural crop residues creates problems in air pollution. Large scale laboratory type experiments and field trials are being conducted to evaluate yields of pollutant gases and particulates and methods for altering these emissions by varying burning practices. Ten to fifty-pound samples of several fuel types were burned under a cone shaped tower which simulates open burning but permits continuous analysis of total hydrocarbons, carbon dioxide, carbon monoxide, and oxygen. Grab samples were taken at two or more intervals during the fire for analysis of nitrogen dioxide and individual hydrocarbons. Particulates were collected isokinetically throughout the fires. Rate of weight loss of the burning fuel, temperature and airflow were also recorded. From these data, yield of pollutant in lbs/ton of fuel burned were calculated. Field plots of forest floor fuels and straw and stubble from cereal crops were also burned. A ten-foot tower instrumented for temperature, carbon dioxide, and particulate was set up in plots in grain fields and it sampled the smoke as fires burned past the tower. A modified version of Boubel s portable particulate sampler, which also provides for gas sampling, was evaluated for possible use in forest plots. For both laboratory and field fires, variables presently being tested for effect on pollution are fuel type, loading, moisture level, methods of ignition, piled versus spread fuels, and head versus back fires.

22974 APTIC NO. 42911

Buckham, J. A., B. R. Dickey, F. R. Keller, and N. K. Sowards

A PROPOSED CYCLE FOR POWER PRODUCTION FROM INCINERATION OF MUNICIPAL AND WOOD WASTES. *Preprint, Combustion Institute, Western States Section, 21p., 1972. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-4.)*

Approximately 25 million tons of residential, commercial, and institutional wastes, produced in the United States each year, are burned in inefficient conventional incinerators which produce air pollution. The lumber industry produces approximately 5 million tons of wood wastes each year; these wastes are usually burned in inefficient teepee burners which cause air pollution by emitting smoke, particulate matter, and partially-oxidized chemicals. A detailed combustion and power conversion concept is presented which involves the conversion of wood and municipal wastes to useful power. Engineering analyses of the concept were based on consumption of 900,000 tons/yr of fuel, consisting of approximately equal quantities of municipal and wood waste. This quantity of fuel is sufficient for a plant in the 100 mw size range. After the mixture of waste is screened, shredded, and stored, it is partially dried and charged to a fluidized bed burner, operating at 150 psia and in the temperature range of 1400-1500 F. Combustion occurs in an inert bed of sand; the efficient solids and gas contact in the bed results in rapid and complete combustion. Ash and noncombustibles are continually withdrawn from the burner. Some particulate is carried overhead in the offgas. Steam, generated fro condensate passing through the tubes of an in-bed heat exchanger, flows to a steam turbine- generator to produce electrical power. Flue gases from the fluidized bed are cleaned of particulate matter, using a combination of cyclones and high efficiency filters. The particulate free flue gas then flows to a gas turbine to generate additional electric power. The preliminary technical and economic evaluation of the proposed concept is encouraging. Power costs in the 5-6 mills/kwh range are indicated, including recovery of transportation costs to a centrally located plant site. Application of fluidized bed technology can result in a solid waste disposal-power generator of high thermal efficiency with a beneficial impact on the environment.

22975 APTIC NO. 43276

Cairns, E. J., R. K. Steunenber J. P. Ackerman, B. A. Feay, D. M. Gruen, M. L. Kyle, T. W. Latimer, J. N. Mundy, R. Rubischko, H. Shimotake, D. E. Walker, A. J. Zielen, and A. D. Tevebaugh

DEVELOPMENT OF HIGH-ENERGY BATTERIES FOR ELECTRIC VEHICLES. PROGRESS REPORT FOR THE PERIOD JULY 1970-JUNE 1971. *Argonne National Lab., Ill., Chemical Engineering Div., 87p., Dec. 1971. 28 refs.*

NTIS: ANL-7888

Batteries having the performance capabilities required for pollution-free electric automobiles should have an energy storage capability of 220 W-hr/kg and be able to deliver power at a peak rate of 220 W/kg. Their cost should not exceed about $10/kW-hr of energy storage capability. Lithium/sulfur cells using a molten lithium halide-containing electrolyte and operating at 360-390 C have achieved capacity densities in a High-Energy Battery Development Program of up to 0.52 A-hr/sq cm (above 1 V) at a current density of 0.52 A/sq cm. These results are consistent with the specific energy and specific power goals, but the cycle life and the sulfur electrode performance require further improvement. The solubility of cathode materials in various electrolytes and the identity of the soluble species are being studied. Mass transport studies have shown that an improved cycle life of the lithium electrode can be obtained by using lithium fluoride-lithium chloride-potassium chloride electrolyte and by minimizing the concentration of various impurities in the cell. Corrosion rates of various materials were also investigated, and battery design and performance calculations were carried out for a 1075-pound Li/S battery in a 4300-pound electric automobile. (Author abstract modified)

22976 APTIC NO. 43444

Cantoni, A.

SMOKE DUCTS FOR DOMESTIC FURNACES. *(Conduits de fumee desservant (les foyers domestiques). Text in French. Promoclim, no. 14:259-267, April 1971. (Also: Am. Inst. Tech. Batiment Trav. Pub., no. 278, 1971.)*

Historic development, certain inconveniences, and repair of smoke ducts in existing buildings are outlined. The development of stoves with slow combustion, representing a considerable achievement, involves known inconveniences due to the increased amount of combustion residues such as soot, scale, and bister. The scale, though practically inflammable when deposited in a hard layer on the inner walls, may produce chimney fires. Bister is formed particularly during the initial period of the combustion of fuels with high water content due to condensation processes. When switching over from wood or coal to gas or oil firing, conventional smoke ducts should be adapted accordingly. The adaptation can be made by inside coating or tubing, in taking the action of the acid combustion products into account. Low-capacity domestic boilers should not be connected to conventional smoke ducts. The combustion products from gas firing are of both low volume and temperature, and of high acidity due to sulfur dioxide. The sulfuric acid formed inside such brick smoke ducts may attack the lime of the bricks. The dew point may be reached inside long smoke ducts. Fuel oil firings, connected to conventional smoke ducts with large cross-section area, particularly when operated periodically, may cause bister on the cold inside surfaces.

22977 APTIC NO. 43385

Choumer, S.

LOW TEMPERATURE WET CORROSION OCCURRING IN BOILERS FROM HEAVY OIL FUEL CONSUMPTION. *(Etude de la corrosion humide a basse temperature des generateurs de vapeur par les residus de combustion du mazout lourd). Text in French. Rev. Gen. Thermique (Paris), 10(118):865-876, Oct. 1971. 15 refs.*

Studies on the low-temperature wet corrosion of boilers due to the condensation of sulfuric acid from the flue gases on cold surfaces are described. The sulfur dioxide formed during combustion is converted into sulfur trioxide at a rate of 0.1-5%, depending on the air-excess coefficient, while the SO3 concentration in the gas is a function of the concentration of the H2SO4 deposited and of the dew point of the acid. The aggressivity of the H2SO4 for soft steel is a function of the concentration of the acid condensed. The above concentration is subject to the liquid-vapor equilibrium in the binary water-H2SO4 mixture under 0.1 at pressure, which latter pressure is the partial pressure of water vapor in the waste gas. The H2SO4 concentration at dew point was in a range of 80-90%. Minimum corrosion at 65% of H2SO4 (about 90 C) and very intense corrosion for lower acid concentrations was found. The corrosion was most intense for a concentration of 75% (about 120 C), and no corrosion at all occurred at 95% concentration due to passivation. Very rapid corrosion at concentrations below 65% was observed. The dew point of H2SO4 is in a range of 130-180 C for most boilers burning heavy oil fuel. The corrosion rate, low at the dew point, reached its maximum at a temperature 30-40 C lower than the dew point.

22978 APTIC NO. 42377

Corbeil, R. J. and S. Smith Griswold

ADVANTAGES OF NATURAL GAS (METHANE) AS A FUEL FOR MOTOR VEHICLES. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 624-631. (Dec. 6-11, Paper EN 10A.)*

The advantages of natural gas over conventional gasolines were presented; test results were obtained from vehicles equipped with the dual fuel system, which permits operation with gasoline as a standby fuel and routine operation on compressed natural gas. The use of compressed natural gas is restricted because fueling stations are widely spaced and tank size and weight are limited. Liquefied natural gas permits extended range and is best suited for vehicles traveling more than 80-100 miles between fuelings. The gas/air mixer provides uniform mixture distribution and maintains excess air in the mixture at all times; virtual elimination of carbon monoxide is an expected result. In addition, hydrocarbon emissions from the carburetor and fuel tank evaporation are almost zero. The chemical characteristics of natural gas along with the accurate control of the variable venturi mixer permit satisfactory vehicle operation with low oxides of nitrogen. Thus the use of natural gas can reduce emissions to levels of any exhaust emission standards yet proposed. Other advantages are: the total elimination of lead; the virtual elimination of soot; the improvement of odor; reliable idling; stumble-free acceleration; and greater safety. Natural gas also has economic advantages: approximately 50% benefit when idling and substantial savings on operating and maintenance costs; and easy starting.

22979 APTIC NO. 43293

Cross, Frank L., Jr. and Richard W. Eldredge

WHAT DRASTIC CHANGES MUST BE MADE TO SAVE OUR ENVIRONMENT. *Preprint, Weston (Roy F.) Co., Inc., West Chester, Pa., 3p., 1971 (?). 5 refs.*

Three ways to achieve positive control of air pollution, water pollution and solid waste are control of pollution sources, ruralization, and population control. Data for minor emission sources are presented, including rubber particulates from vehicular tires, organic compounds from perfumes, ground dust from natural sources, smoke from cigarettes, cosmic dust, hydrogen sulfide from natural sources, aerosols and vapors from aerosol cans, salt particles from ocean spray, organic compounds from vegetation, smoke from cigars, foot wear use, and naphthalene in moth balls. The population trend of migration from rural to urban areas is reviewed. Population growth controls are considered.

22980 APTIC NO. 43584

Davidson, D. C. and J. Highley

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSION OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED BED COMBUSTION OF COAL. APPENDIX 7. COAL STUDIES. (TASK VII). *National Coal Board, London (England), Fluidised Combustion Control Group, Office of Air Programs APTD-1084, Rept. DHB 060971, 7p., Sept. 1971.*

NTIS: PB 210675

The effects of the type of coal and its associated mineral matter on sulfur retention in fluidized bed combustion of coal were investigated. U. S. Pittsburgh and U. K. Welbeck coal types were analyzed for caking and swelling properties and forms of sulfur content. The sulfur content of the gas released after coal combustion was then measured to determine the sulfur release from the coals. In both coals, almost all of the pyritic sulfur was released in 100 ms, but less than half of the organic sulfur was released. The amount of organic sulfur released from the Welbeck coal was 30% more than from the Pittsburgh coal, with a 20% greater release of total sulfur. The ratio of organic to pyritic sulfur in the chars and the fines was also calculated and compared. In general, the actual release rates vary with coal type and may be affected by the operating conditions, particularly by whether the surrounding gas is oxidizing or reducing.

22981 APTIC NO. 43630

Davis, W. E.

NATIONAL INVENTORY OF SOURCES AND EMISSIONS. BARIUM, BORON, COPPER, SELENIUM, AND ZINC. 1969. SECTION II. BORON. *Davis (W. E.) and Associates, Leawood, Kans., Office of Air Programs Contract 68-02-0100, APTD-1159, 44p., June 1972. 6 refs.*

NTIS: PB 210677

The major sources and emissions of boron and the flow of boron in the U. S. were traced and charted for 1969. The consumption was 85,864 tons, while domestic production totaled 171,361 tons. Imports and exports were 803 and 86,084 tons, respectively. Boron emissions to the atmosphere, categorized by source and region, equalled 11,003 tons. The major sources included mining (0.9%), processing (21.8%), end product use in glass, ceramic coatings, agricultural chemicals, and soaps and detergents (34.5%), and combustion sources (coal, sewage, and sludge) (42.8%). Air pollution control equipment applicable to the industry included cyclones, scrubbers, baghouses, and electrostatic precipitators. (Author summary modified)

22982 APTIC NO. 43374

Dennis, Jack W.

TURBOCHARGED DIESEL ENGINE PERFORMANCE AT ALTITUDE. *Preprint, Society of Automotive Engineers, Inc., New York, 20p., 1971. 11 refs. (Presented at the Society of Automotive Engineers National Combined Fuels and Lubricants, Powerplant and Truck Meetings, St. Louis, Mo., Oct. 26-29, 1971, Paper 710822.)*

The effect of altitude on the performance of two turbocharged prechamber diesel engines and one direct-injection diesel engine, with respect to brake mean effective pressure, speed, turbine inlet temperature, smoke emissions, ignition delay, and fuel-air ratio, was studied in a test cell. One pre-chamber engine was tested at altitudes up to 16,000 ft. Test data are presented and compared with performance at standard conditions. An analytical model for predicting the performance of diesel engines at altitude was then developed using an iterative computer program with part load data at standard conditions. The approach was superior to the more usual average-engine or density-derating methods, particularly in the prediction of air-fuel ratio or smoke. (Author abstract modified)

22983 APTIC NO. 42454

Domning, W. E., J. E. Feldman, and A. J. Johnson

KILN INCINERATION. *In: Research and Ecology Annual Report. Chemistry Research and Development. Dow Chemical Co., Golden, Colo., Rocky Flats Div., Atomic Energy Commission Contract AT (29-1)-1106, p. 32-34, April 14, 1972.*

NTIS: RFP-1837-A

Rocky Flats contaminated waste that is to be incinerated consists mostly of plastic, paper, and rubber gloves. About 40% of this waste is polyvinyl chloride (PVC). Decomposition of this compound produces hydrogen chloride, which is corrosive when hydrolyzed to hydrochloric acid. A method for in situ neutralization of HCl formed from burning PVC by admixing a strong base with the waste to be burned is described. The general approach to this development has been to briquette the burnable waste with sodium carbonate or sodium hydroxide to neutralize the evolved hydrochloric acid. The briquetted waste is fed into the top of a stack kiln and passed down into the combustion zone. The hydrochloric acid evolved is then neutralized, mostly within the individual briquettes and the remainder by contact with unburned briquettes. Successful application of this method could reduce corrosive effects of incinerator off-gases between the burning chamber and the caustic scrubbers, or could possibly make caustic scrubbers unneccessary.

22984 APTIC NO. 42445

Edelman, Raymond and Constantino Economos

A MATHEMATICAL MODEL FOR JET ENGINE COMBUSTOR POLLUTANT EMISSIONS. *Preprint, American Inst. of Aeronautics and Astronautics, New York, and Society of Automotive Engineers, Inc., New York, 20p., 1971. 24 refs. (Presented at the American Institute of Aeronautics and Astronautics Society of Automotive Engineers, Propulsion Joint Specialist Conference, 7th, Salt Lake City, Utah, June 14-18, 1971, AIAA Paper 71-714.)*

A mathematical model based on a modular concept is presented which describes the combustion and pollution formation processes in a jet engine turbine combustor. The model includes turbulent mixing and reaction kinetics appropriate to the coupled fuel oxidation and pollutant species formation process, as well as the effects of two phase flow, recirculation, and swirl. The modular concept is unique and permits each relevant process to be studied individually or coupled as a function of operating and geometric parameters. The importance of primary zone parameters upon carbon monoxide, oxides of nitrogen, hydrocarbons, and soot formation is delineated. (Author abstract modified)

22985 APTIC NO. 42988

Ewbank, Walter J. and Darrel G. Harden

THERMODYNAMICS, GARBAGE AND POLLUTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1972. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-172.)*

Energetic concepts are applied to the problems of garbage and pollution. These problems have one common factor: low energy utility mass. Energy utilization has, as one end result, mass with a lower energy utility defined as garbage. Energetic concepts developed with thermodynamics as a background can be applied in understanding the garbage and pollution problem. The concept of entropy is utilized to rank energy transfer processes with respect to their nearness to an ideal reversible process. A generalized model to calculate entropy changes from potential changes is developed. The problem of recognizing the governing potentials for unruly processes is a major one. A methodological framework is discussed. Automotive air pollution, solid waste disposal, and steam power plants are mentioned.

22986 APTIC NO. 43670

Feher, Viola

ATMOSPHERIC HYGIENE PROBLEMS IN THE CITY OF BUDAPEST. *(Budapest levegohigienias kerdesei). Text in Hungarian. Budapesti Kozegeszsegugy, no. 1:5-8, 1969.*

Atmospheric hygiene problems in Budapest and joint efforts made by the Budapest Public Health and Epidemiological Station and other institutions and authorities are described. A comprehensive air-pollution abatement program was launched in 1962. Emission measurements and organoleptic evaluations were carried out to survey emission sources. Combustion, primarily due to low-quality fuel, such as high-sulfur coal, as well as obsolete boilers, was found to be responsible for some 75% of the total air pollution in Budapest. This finding underscores the need for other energy sources, e.g., gas, and modernization of heating equipment. The problem of industry-generated air pollution will be solved by introducing modern technologies or displacing industrial plants from Budapest. Exhaust emissions from Diesel engines can be satisfactorily controlled by means of a standardized test and adjustment procedure. Gasoline engine exhaust causes many problems, primarily due to the lack of specialists, adequate service stations, and the chronic shortage of spare parts.

22987 APTIC NO. 43573

Flood, Leo P.

SOOT AND ODOR PROBLEMS FROM BURNING RESIDUAL FUEL OIL. *Proc. Air Pollution Control Assoc., vol. 49:38-1 to 38-11, 1956.*

Soot and odor problems from burning residual fuel oil are discussed. The problem is complicated by the varying heights of the buildings, by their contiguity, and the lack of legislative controls on the quality and viscosity of the fuel oil used. Formation of pollutants may be prevented by the proper selection of fuels, by correct and ample design of burning equipment, and by strict maintenance and careful operation. The complete combustion process of heavy fuel oil is reviewed. Designs of installations and equipment, including combustion chambers, boilers, windboxes, bridge walls, corbels, strainers, atomizing cups, breechings, filters, flues, and chmneys, which would minimize soot, odor, and smoke emissions are discussed. Emission standards for New York City are considered.

22988 APTIC NO. 42466

Friedrich, F. D.

THE INCINERATION OF POLYMERS - A COMBUSTION ENGINEER S VIEWPOINT. *Dept. of Energy, Mines and Resources, Ottawa (Ontario), Canadian Combustion Research Lab., TB 135, 20p., April 1971. 12 refs.*

The incineration of polymers can present difficult combustion problems and can lead to the emission of corrosive or poisonous compounds to the atmosphere. Typical municipal waste presently contains about 1.5% polymers, mostly in the form of plastic packaging materials. This can be adequately handled by well-designed municipal incinerators, and a typical system is described. Industrial incineration of pure polymers presents more serious problems, and each case should be dealt with separately. The factors which should be considered are outlined, and the combustion properties of some common polymers are described. Sometimes pilot-scale research may be necessary to develop a suitable incineration system. (Author abstract)

22989 APTIC NO. 42883

Germerdonk, Rolf

THERMAL DECOMPOSITION OF WASTE GASES CONTAINING NITROGEN OXIDE FUMES AND AMINES. *(Versuche zum thermischen Zersetzen von nitrose- und amin-ahltiger Abluft). Text in German. Chem -Ing. -Tech., 44 (5):332-337, 1972. 19 refs. (Presented at the Jahrestreffen der Verfahrens-Ingenieure, Nuernberg, West Germany, Sept. 21-23, 1971.)*

The degree of decomposition of nitrogen oxides in highly contaminated exhaust gases achievable by thermal processes is determined far less by reaction equilibrium than by the reaction rates. At high flame temperatures, the overall reaction: nitric oxide + carbon monoxide yields carbon dioxide + 1/2 nitrogen appears to make the greatest contribution to the destruction of the nitrogen oxides. Two experimental burners built in view of this finding are described. It is possible to keep the entry concentration at the burner to less than 500 ppm NO over the whole range of operation with a fixed burner setting. (Author abstract modified)

22990 APTIC NO. 42901

Glaser, Peter E.

POWER FROM SPACE - TECHNOLOGY TRANSFER FOR HUMAN SURVIVAL. *Advan. Astronaut. Sci. Suppl., vol. 26:263-280, 1971. 35 refs. (Presented at the American Astronautical Society and the American Institute of Astronautics and Aeronautics, Special Technical Event, Winrock, Ark., Oct. 30, 1970, Paper AAS70-088.)*

A concept for a satellite solar power station is described to meet future large-scale electrical power requirements without producing undesirable environmental pollution. Considerations are given to satellite orbit, solar energy conversion, microwave generation and transmission, and conversion of microwave energy to electrical power on earth. The design considerations and the development tasks for a large satellite solar power station are reviewed and the potential technological needs are identified. (Author abstract modified)

22991 APTIC NO. 42304

Grenzdoerfer, J.

SUPERSONIC AIR TRAFFIC. *(Betrachtungen zum Ueberschall-Luftverkehr). Text in German. Technik (Berlin), 27(6):361-365, June 1972. 8 refs.*

Supersonic airplanes will be relatively small polluters of the air. They will emit carbon monoxide, nitrogen oxides, and hydrocarbons. A steam engine consumes 2 kg fuel/HPh, a passenger car 0.5 kg, and supersonic airplanes only 0.25 kg. The pollution will amount to only one tenth of that by ocean liners (per capacity unit) and one sixth of that of piston engine airplanes. As far as the fear is concerned that supersonic airplanes consume too much oxygen, it can be said that these planes travel at altitudes of 15 and 20 km. Three quarters of the entire air mass are between the surface of the earth and an altitude of 11 km.

22992 APTIC NO. 42444

Hammond, D. C., Jr. and A. M. Mellor

ANALYTICAL CALCULATIONS FOR THE PERFORMANCE AND POLLUTANT EMISSIONS OF GAS TURBINE COMBUSTORS. *Preprint, American Inst. of Aeronautics and Astronautics, New York, and Society of Automotive Engineers, Inc., New York, 11p., 1971. 35 refs. (Presented at the American Institute of Aeronautics and Astronautics Society of Automotive Engineers, Propulsion Joint Specialist Conference, 7th, Salt Lake City, Utah, June 14-18, 1971, AIAA Paper 71-711.)*

An analytical model was developed which approximates the entire gas turbine combustor as a collection of perfectly stirred zones. Within each zone a general hydrocarbon combustion mechanism is used to predict gas composition and temperature. Zone volumes and sizes are assigned from consideration of the theoretically predicted gas flows, thereby approximating the mixing behavior of the system. Selected performance and pollutant predictions of the overall model for a typical aircraft combustor are presented. (Author abstract modified)

22993 APTIC NO. 43612

Heywood, John B.

GAS TURBINE COMBUSTOR MODELING FOR CALCULATING NITRIC OXIDE EMISSIONS. *Preprint, American Inst. of Aeronautics and Astronautics, New York, and Society of Automotive Engineers, Inc., New York, 8p., 1971. 16 refs. (Presented at the American Institute of Aeronautics and Astronautics, Society of Automotive Engineers, Propulsion Joint Specialist Conference, 7th, Salt Lake City, Utah, June 14-18, 1971, AIAA Paper 71-712.)*

Two aspects of models used to predict nitric oxide formation in gas turbine combustors are examined. At typical combustor primary zone conditions, the validity of assuming atomic oxygen, the hydroxide radical, atomic hydrogen, and molecular oxygen in equilibrium in the burned gas where most of the NO is formed is assessed. The effect of assuming atomic nitrogen in steady state, or in equilibrium, and the effect of additional reactions in the NO kinetic scheme are evaluated. The techniques which have been used to model the flow are summarized, and the importance of including nonuniformities in gas temperature and composition and a distribution of residence times are reviewed. Nonuniformities in the flow must be included before satisfactory agreement with exhaust measurements over a wide range of engine loads can be obtained. The effects of variations in mean primary zone equivalence ratio, engine compressor pressure ratio, and mean residence time are discussed. (Author abstract modified)

22994 APTIC NO. 42840

Hiramatsu, Kinji

THE STUDY OF PYROLYTIC PRODUCTS OF POLYMER MATERIALS BY MASS SPECTROMETRY (VIII). THE COMBUSTION GASES FROM RESIN COATINGS. *(Shitsuryo bunseki ni yoru kobunshi zairyo no netsu bunkai seiseibutsu ni kansuru kenkyu (VIII) Tomaku no nensho seisei gasu ni tsuite). Text in Japanese. Shitsuryo Bunseki (Mass Spectroscopy), 19(4):316-325, 1971. 3 refs.*

The composition and smoke concentration of gaseous products formed during pyrolysis of resin coating were studied by mass spectrometric analysis. The main combustion products of 21 coating materials such as oil paints, phthalic resin varnishes, and phenolic resin varnishes at 700 to 800 C were carbon dioxide, carbon monoxide, methane, ethane, ethylene, propylene, hydrogen, oxygen, nitrogen, and argon. Hydrogen cyanide occurred in the gaseous products obtained from clear lacquer, acryl resin varnish, melamine resin varnish, urea resin varnish, epoxy resin varnish, tar epoxy resin, and polyurethane resin varnish.

22995 APTIC NO. 43607

Hoffman, Alan J.

BATON ROUGE METROPOLITAN AREA AIR POLLUTANT EMISSION INVENTORY. *National Air Pollution Control Administration, Durham, N. C., Air Quality and Emission Data Div., Office Air Programs Pub-APTD-0866, 2p., Jan. 1970. 6 refs.*

NTIS: PB 205255

An emissions inventory is presented for the Baton Rouge Metropolitan Area. The pollutants, which include sulfur oxides, particulates, carbon monoxide, hydrocarbons, and nitrogen oxides, are delineated with respect to source type, season of the year, and geographical distribution within the area. Emissions were estimated by using various indicators such as fuel consumption, refuse burning rates, vehicle-miles, production data, control efficiencies, and emission factors relating these indicators to emission rates.

22996 APTIC NO. 43236

Hutchinson, G. L. and F. G. Viets, Jr.

NITROGEN ENRICHMENT OF SURFACE WATER BY ABSORPTION OF AMMONIA VOLATILIZED FROM CATTLE FEEDLOTS. *Science, vol. 166:514-515, Oct. 1969. 5 refs.*

Results of research to determine absorption rate of ammonia from air by aqueous surfaces under different conditions of temperature and climate at various distances and directions from feed lots, are discussed. Apparatus designed to measure absorption of ammonia from air by aqueous surfaces was installed near several cattle feedlots and in appropriate control areas. Ammonia absorption rates measured near feedlots were as much as 20 times greater than near the control. Their magnitudes indicate that absorption of ammonia volatilized from cattle feedlots contributes significantly to the nitrogen enrichment of surface water in the vicinity of feedlots. (Author abstract)

22997 APTIC NO. 43198

I Anson, J. E., C. J. Bradley, and D. L. Robertson

GRAY IRON FOUNDRIES TAKE THE STAND. *West. Metals, 8(3):23-24, 1950.*

The salient features of the California Assembly Bill No. 1 concerning the control and suppression of air pollutants are reviewed together with Los Angeles County emission standards. The objectives of a voluntary association of 38 gray iron foundries in Los Angeles County, in relation to pollution control regulations, are presented. To determine the contribution of the gray iron foundry industry to Los Angeles smog, the foundries consumption of metallics, coke and limestone was survived, and particle sizes in emissions were analyzed Of the 6.30 tons/day of particulates emissions from 49 cupolar, 0.432 tons were less than 5 micron. The 0.432 tons (or 966 lbs) are the only probable contribution of the gray iron foundry industry to the smog problem.

22998 APTIC NO. 42949

Jain, L. K. and T. J. Hixson

APPLICABILITY STUDY COAL GASIFICATION PROCESS. (FINAL REPORT). *Catalytic, Inc., Charlotte, N. C., Office of Air Programs Contract 68-02-0241, Catalytic Proj. 41937, Task 8, APTD-1103, 24p., March 1972. 5 refs.*

NTIS: PB 208944

A study was conducted to determine the applicability of a coal gasification process to electric utility and industrial boiler facilities for new installations and for the retrofit of existing installations. The process consists basically of a cylindrical shaped, refractory-lined metal structure, termed a combustor, to convert pulverized coal into a low BTU fuel gas. The prime product is a high temperature (2500 F 2700 F) gas rich in carbon monoxide and hydrogen, with approximately 175 BTU/std cu ft available heat of combustion. Preliminary data indicates that negligible amounts of particulate matter are found in the off-gas. The sulfur-containing slag is treated by a Claus process to produce elemental sulfur as a product. Evaluation of the process with respect to cost, space limitations, operational maintenance, and safety aspects is covered along with a number of technical difficulties and unresolved problems. The use of the coal gasification process may offer potential capital cost savings, compared to existing methods of sulfur removal in the combustion of coal, markets for caking-type high sulfur coals (10,000 BTU/lb. or less), and a method of reducing particulate emissions by converting coal to a cleaner fuel.

22999 APTIC NO. 43307

Kester, Richard A.

HOG FUEL BOILER PLUME OPACITY RELATED TO OPERATING PARAMETERS. *Preprint, Combustion Institute, Western States Section, 20p., 1972. 21 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-15, 1972, Paper WSCI 72-2.)*

The relationship between operator controllable variables and visible smoke from a 60,000 lb/hr wood waste (hog fuel) fired boiler was investigated. The underlying premises were that condensing hydrocarbons were primarily responsible for the plume opacity, and that these hydrocarbons could be minimized by furnace adjustment for more complete combustion. Measured variables were stack opacity recorded by a trained observer and breeching temperature, fuel pile height, percent moisture, auxiliary fuel rate, empirical air to fuel ratio, relative humidity, and ambient temperature recorded by a smokemeter. Using a stepwise linear regression analyses, it was possible to rank the variables and develop a correlation equation for observed plume opacity. Total hydrocarbons, measured with a flame ionization hydrocarbon analyzer, were correlated to plume opacity, and a direct linear relationship was shown.

23000 APTIC NO. 43310

Khan, I. M., C. H. T. Wang, and B. E. Langridge

EFFECT OF AIR SWIRL ON SMOKE AND GASEOUS EMISSIONS FROM DIRECT- INJECTION DIESEL ENGINES. *Preprint, Society of Automotive Engineers, Inc., New York, 9p., 1972. 15 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1972, Paper 720102.)*

The formation and emission of pollutants associated with diesel engines is determined by the details of the fuel-air mixing process and the related spatial and temporal distribution of equivalence ratio and temperature in the combustion chamber. For a given chamber configuration, fuel-air mixing is largely governed by the fuel injection equipment characteristics and by air swirl levels. The results obtained from test of the effect of air swirl variations on smoke and gaseous emissions from direct injection-type diesel engines are discussed. Two single-cylinder direct-injection diesel engines were used; one had a 1.1 swept volume and a disc-type combustion chamber, while the other had a swept volume of 1.361 and a toroidal combustion chamber. Each engine was equipped with four nozzle holes which were approximately centrally placed and had a nominal compression ratio of 16:1. Within the limits of the swirl variations used, and increase in swirl reduced emissions of smoke and carbon monoxide but increased nitric oxide emissions. An increase in swirl also makes it possible to retard appreciably the injection timing for optimum engine efficiency, and this more than compensates for the increase in nitric oxide emission due to the increase in swirl. The air swirl intervenes in the processes of smoke and gaseous pollutant formation by affecting the details of the fuel-air mixing processes.

23001 APTIC NO. 42423

Kobayakawa, Takashi

A PILOT RESEARCH ON AN OPTIMUM COMBINATION OF MOTORS FOR PREVENTION OF AIR POLLUTION. *(Kogai boshi no tame no gendoki no saiteki kumiawase ni kansuru shisaku kenkyu). Text in Japanese. Unyusho Kagaku Gijutsu Shiken Kenkyu Hojokin ni yoru Shiken kenkyu Seikashu (Prog. Rep. Pilot Res. Minist. Transport. Sci. Technol. Test Res. Subsid.), no. 17:121-126, Aug. 1971.*

A nonpolluting car combining a gasoline engine and an electric generator was tested for its gas-purification ability, capability of the electric system, and capability as an automobile. The generator is directly connected to the engine for generating electricity, and the engine is not used for motivating the automobile, but exclusively for the generator. An afterburner is used for exhaust purification. Engine rotation speed is confined to 2000-5000 rpm in order to control noise. Gas purification goals are 0.1% (lower limit) for carbon monoxide, for hydrocarbons (upper limit), 30 ppm, and 30 ppm for nitrogen oxides (upper limit). Test results showed CO concentration of 0.087% and a hydrocarbon concentration of 24.0 ppm. The nitrogen oxide concentration was 96.9 ppm, or more than three times higher than the goal value. This is believed due to insufficient engine torque, as a result of which the engine cannot provide the output required and constantly runs at an overload condition.

23002 APTIC NO. 43300

Lamoureux, Robert L.

DRIVING AND VEHICLE USE PATTERNS IN MAJOR METROPOLITAN CITIES- PHASE I. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1972. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami Beach, Fla., June 18-22, 1972, Paper 72-176.)*

Approximately 1000 volunteer participants in six U. S. cities (Los Angeles, California; Houston, Texas; Cincinnati, Ohio; Chicago, Illinois; Minneapolis St. Paul, Minnesota; and New York, New York) had their automobiles instrumented with recording speedometers for one week. The data collected by these instruments, supplemented by data entered into logbooks by the participating drivers, were analyzed to identify significant patterns of driving behavior and automobile use. The results of the survey were used as a basis for subsequent studies directed toward developing the operations data (Phase II) and also to amend the 1972 CBS Federal Test Procedure to provide for cold-hot weighting. The autos surveyed made over 30,000 trips covering over 228,000 miles. On weekdays, the average driver made four and a half trips/day, spent one hour and 19 minutes on the road, and covered about 34 miles. On weekends he drove less, about four trips/day, about an hour on the road, and only 26 miles/day. Time distribution of trips, reasons for trips, and use of freeways were studied.

23003 APTIC NO. 42934

Levy, A., S. E. Miller, R. E. Barrett, E. J. Schulz R. H. Melvin, W. H. Axtman, and D. W. Locklin

A FIELD INVESTIGATION OF EMISSIONS FROM FUEL OIL COMBUSTION FOR SPACE HEATING. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., American Petroleum Inst. Pub-4099, API Proj: SS-5, 140p., Nov. 1, 1971. 36 refs.*

Measurements of operating parameters and of gaseous and particulate emissions were made on 20 oil-fired residential heating units and 8 commercial boilers during the 1970-71 heating season. Units selected were a cross section of heating units in service. Measurements were made for smoke, carbon dioxide, carbon monoxide, total hydrocarbons, sulfur dioxide, nitrogen oxides, and filterable and total particulates. Values were compared to previous data and found to be higher for CO and NOx and lower for HC and filterable particulates. Smoke number on the Bacharach scale was not a good measure of integrated particulate emissions on a weighted basis. Tuning to lower smoke levels produced no reduction in average emissions. The most significant step to reduce area-wide emissions is to identify and renovate or replace poorly operating units. Factors affecting pollutants include fuel type, firing rate, nitrogen content of fuel, excess air, and stack temperature.

23004 APTIC NO. 43661

Lindvall, Thomas and S. -E. Mortstedt

INVESTIGATION OF THE ODOR INTENSITY OF INTERNAL COMBUSTION ENGINE EXHAUSTS. *(Undersokning av luktstyrkan hos avgaser fran forbranningsmotorer). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-52, 13p., Sept. 2, 1970.*

The absolute odor intensity of exhausts from Diesel and gasoline engines with and without pollution control devices, operating under different conditions, was determined by means of an odor panel. The pollution control devices had no influence on the odor intensity of the exhausts from the Diesel and gasoline engines, while the exhausts of the latter were of slightly higher intensity compared to Diesel exhausts. No significant differences between the three gasoline engines investigated were observed, and the intensities obtained for idling and ECE cycle tests were largely of the same order of magnitude. The Diesel engines showed a general, though statistically not secured, tendency towards decreased odor intensity with increased load, while the intensity was largely independent of the engine speed. The odor intensity of exhausts from diesels powered with standard and light fuel was about the same. The odor thresholds, expressed as the logarithm of the dilution factor, were 3.17 for Diesel engines without exhaust control during idling, and 3.72-3.83 for gasoline engines equipped with different pollution control devices.

23005 *APTIC NO. 43306*

Locklin, D. W., R. E. Barrett, S. E. Miller, and A. Levy

A FIELD INVESTIGATION OF EMISSIONS FROM FUEL OIL COMBUSTION FOR SPACE HEATING. Preprint, Combustion Institute, Western States Section, 18p., 1972. 7 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-22.)

The principal objective of Phase I of this study was to develop, through appropriate field measurements, more comprehensive and up to-date emission data from combustion equipment used for residential and commerical space heating. Measurements of gaseous and particulate emissions were made by a three-man field sampling team for a total of 20 oil-fired and two gas-fired residential heating installations and eight commerical boiler installations, under various conditions of operation and for various fuels. For the 20 oil-fired units in the as-found conditions, the average smoke level was number 4.2 on the Bacharach scale, with readings ranging from 1 to 8, and the average carbon dioxide level was 7.9%. Adjustment by normal cleanup and service procedures to the tuned condition reduced the average smoke level to 1.6, with smoke readings ranging from 0.5 to 3; this was accomplished with an increase in the CO2 adjustment for some units and a decrease for others, but the average CO2 level for all tuned units remained unchanged at 7.9%. The effect of tuning on gaseous and particulate emissions was variable, with emissions decreasing for some pollutants on some units and increasing for others; the most consistent pattern was that the nitrogen oxides emission levels generally increased on tuning. Emission levels for the cold-start condition were not significantly different from the as-found condition; the emissions measured with the reference fuel were not significantly different from the tuned condition, except lower sulfur dioxide levels reflected a lower fuel-sulfur content. Essentially the entire reduction of pollutant emissions for the residential units was accomplished by replacing the units obviously in poor condition; tuning of the remaining units effected only a minor reduction in emissions. In general, the emission factors for two gas-fired furnaces were lower than the mean for the oil equipment, but the hydrocarbon levels with gas-fired units were nearly as high. Emission levels for the boilers firing distillate fuel were generally lower than for those firing residual fuel. The highest particulate emissions were measured with the heaviest residual fuels; sulfur dioxide emission levels increased in proportion to sulfur content of the fuel, and nitrogen oxides emissions generally increased with increasing fuel-nitrogen content and increasing firing rate.

23006 APTIC NO. 42918

Mann, M. J., C. A. Depew, and R. C. Corlett

A LABORATORY SIMULATION OF WOOD PYROLYSIS UNDER FIELD CONDITIONS. *Preprint, Combustion Institute, Western States Section, 10p., 1972. 9 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-13.)*

The disposal of logging slash by burning is an important forest management tool. Selection of optimal burning methods involves a trade between considerations of economics and fire control and those of air pollution potential. Among controllable variables are the intensity of burning and various chemical treatments of the fuel, such as the addition of flame retardants. Deduction of optimal strategies on the basis of field burning experience alone is hampered by inability to vary independently those parameters which control the pyrolysis of the fuel, and through this the formation of air pollutants. A laboratory simulation of wood pyrolysis under field burning conditions, in which the thermal environment experienced by burning fuel elements can be arbitrarily controlled, is presented. This apparatus is capable of imposing ranges of incident radiant flux and ambient air flow rate for a cylindrical wood specimen. Outputs are the specimen weight loss rate and particulate air pollutant production rate. For the results reported here, the fuel was Douglas fir doweling, both plain and treated with the flame retardant Phos-Chek, principally diammonium phosphate. Observed combustion patterns tend to become independent of fuel conditions and retardant treatment of relatively high environmental temperatures. At lower temperatures, combustion patterns are difficult to reproduce, and are very sensitive to flame retardant treatment. On the basis of the limited data so far available, no evidence has been found that flame retardant treatment under otherwise controlled conditions results in reduction of air pollutants.

23007 APTIC NO. 42892

Manos, M. J., J. W. Bozek, and T. A. Huls

EFFECT OF LABORATORY AMBIENT CONDITIONS ON EXHAUST EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1972. 8 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1972, Paper 720124.)*

A program was conducted to determine the effect of temperature and humidity on exhaust emissions from automotive engines. The objective was to determine if the effects were of sufficient magnitude to require the application of correction factors to measured exhaust emissions to standard humidity and temperature values. Both American and foreign-made vehicles were tested at 20 combinations of ambient temperature and humidity. The effect of temperature and humidity was both unpredictable and of little significance for hydrocarbon and carbon monoxide emissions. No correction factors were developed for these exhaust gas constituents. The effect of temperature was of little significance and predictable for oxides of nitrogen. However, humidity effects were significant and predictable for oxides of nitrogen. A correction factor was developed to correct oxides of nitrogen to a standard humidity value and was subsequently incorporated into the federal test procedure for determining automotive exhaust emissions.

23008 APTIC NO. 43305

Maxwell, Floyd D., Neil R. Fetter, and C. Lance Mohler

ENGINE EXHAUST PARTICLES AS POTENTIAL IGNITION SOURCES OF WILDLAND FUELS. *Preprint, Combustion Institute, Western States Section, 127p., 1972. 17 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-19.)*

The ignition of wildland fuels by particles and gases expelled from internal combustion engines has been a problem for many years. Since no extensive study of the problem has been conducted since 1934, this paper describes one part of an effort designed to more fully understand this ignition problem using modern techniques. Analyses and studies of the emitted particles have included particle formation, chemical composition, morphology, energy potential, aerodynamic characteristics, ballistic trajectories, and surface contact with natural cellulosic materials. New dimensions were added to the problem when the analyses and tests revealed the importance of the volatile content and the coefficient of restitution. The possible necessity for studying conductive heat transfer on a microscopic level has been uncovered by using the Scanning Electron Microscope. Preliminary tests and analyses indicate that most exhaust particles are not just carbon; the weight of the volatiles can exceed the weight of the carbon by as much as a factor of three. The main volatile appears to be the engine lubricant which also functions as a partial binder. The results of other preliminary tests indicate that particles having a mean diameter of less than 0.15 cm have statistical significance as a critical parameter in the determination of the ignition threshold of some wildland fuels. The lower limit for significant size depends upon the chemical constituents and the amount of volatiles contained in the particles as well as temperature. The significant lifetime of particles having a diameter of 0.15 cm or greater appears to be at least 30 sec in most cases and 1 min in some cases. In addition, the safe separation distance between exhaust and fuel exceeded 5 m.

23009 APTIC NO. 42758

McGraw, Michael J.

OKLAHOMA CITY METROPOLITAN AREA POLLUTANT EMISSION INVENTORY. *National Air Pollution Control Administration, Durham, N. C., Air Quality and Emission Data Div., Office of Air Programs Pub-APTD-0825, 65p., Feb. 1970. 10 refs.*

NTIS: PB 207694

Five catagories of emissions were examined - transportation, stationary fuel combustion, solid waste disposal, industrial processes and, evaporative losses. Each of these sources was evaluated in two subgroups point sources and area sources. Natural gas is virtually the only fuel used in the Oklahoma City metropolitan area. Forty-eight sources having emissions greater than 0.5 tons/day of any pollutant were classified as point sources. Remaining contributors were considered collectively as area sources. Estimated annual emissions in the Oklahoma City metropolitan area for September 1969 are listed. Sulfur oxides totaled 2200 tons. Motor vehicles contributed 84% of the sulfur oxides. Aircraft and railroads account for 8%, while incineration and open burning account for 8%. Particulates totaled 14,200 tons. Light industrial processes contribute 50% of the particulate emissions. Transportation contributes 29%, refuse disposal 15%, and stationary fuel combustion 8%. Carbon monoxide totaled 429,700 tons. Motor vehicles produce 93% of the carbon monoxide. Railroads and aircraft contribute 4%. Hydrocarbons totaled 150,700 tons. One-third of the total hydrocarbons can be attributed to the production of crude oil. Liquid propane gas plants contribute 17% and evaporative loss from motor vehicles 12%. Exhaust gas from motor vehicles adds 20% and solvent handling 10% of total hydrocarbons. Nitrogen oxides totaled 43,600 tons, of which motor vehicles contributed over 55%. Natural gas combustion accounted for 41%, with 33% attributed to two steam-electric plants.

23010 APTIC NO. 43193

Miller, A. J.

USE OF STEAM-ELECTRIC POWER PLANTS TO PROVIDE THERMAL ENERGY TO URBAN AREAS. *In: Civil Defense Research Project Annual Progress Report. Oak Ridge National Lab., Tenn., Atomic Energy Commission Contract W-7405-eng-26, Rept. UC-41, p. 17-26, March 1972. 6 refs.*

NTIS: ORNL-4679

The use of heat-electric systems in urban complexes was studied and its feasibility was determined for rather large new cities. The degree of city planning and coordination of diverse financial investments would be greater than that which is conventional for this country. These problems of implementation deserve further study for both new and existing urban areas. Low temperature heat from electrical generating plants can be used for energy-intensive urban services and activities such as the space heating of buildings, air conditioning, how water supply, distillation of sea water or sewage plant effluent, snow removal, vehicle propulsion, and manufacturing. Fuel consumption, chemical pollution of the air, and total thermal emission to the biosphere would be reduced.

23011 APTIC NO. 43588

Monroe, F. L., R. A. Rasmussen, W. L. Bamesberger, and D. F. Adams

INVESTIGATION OF EMISSIONS FROM PLYWOOD VENEER DRYERS. (FINAL REPORT). *Washington State Univ., Pullman, College of Engineering, Plywood Research Foundation and Air Pollution Control Office Contract CPA-70-138, APTD-1144, 131p., Feb. 9, 1972. 3 refs.*

NTIS: PB 210583

Gas- and steam-heated, longitudinal and jet plywood veneer dryers using ten wood species types were tested for emission rates and process variables. At stack temperature, the only particulate emission consisted of wood particles in concentrations of less than 0.002g/standard dry cu ft of stack gas. Outside the stack, however, at cooler than stack temperature, hydrocarbons and water typically condensed to form blue haze and/or a water plume. Plume opacities of the blue haze ranged within 0-100%. Douglas fir and ponderosa pine produced the most visible plumes. Total hydrocarbon emissions from the stacks averaged 5.7 lb/10,000 sq ft of 3/8-inch plywood produced; 3.6 lbs represented the condensable fraction, consisting mostly of wood resins, resin acids, and wood sugars. The volatile hydrocarbons consisted of terpenes only in steam-heated dryers and terpenes with natural gas components in gas-fired dryers. Gas velocities, flow rates, temperature, and operating variables were studied; measurement and sampling methods and data analysis are also reviewed. (Author summary modified)

23012 APTIC NO. 43261

Morita, Clyde B.

STATE OF HAWAII AIR POLLUTANT EMISSION INVENTORY. *National Air Pollution Control Administration, Durham, N. C., Air Quality and Emission Data Div., APTD-0817, 60p., Jan. 1970. 18 refs.*

NTIS: PB 210564

The emission inventory for Hawaii is presented. Total emissions of sulfur oxides, nitrogen oxides, hydrocarbons, carbon monoxide, and particulate matter were estimated with respect to source type, season of the year, and geographical distribution. The topography and climate, survey method, and subdivision of the sources into point and area sources are described. The estimated annual emissions were 60,000 tons of SOx, 71,000 tons of particulate matter, 400,000 tons of CO, 76,000 tons of hydrocarbons, and 45,000 tons of NOx. The major source in the urbanized areas was the automobile. In the rural areas, the predominant source was associated with cane sugar production. The five power plants burning residual fuel oil accounted for more than 60% of the SOx emissions, with additional contribution from stationary fuel combustion sources (13%), industrial process losses (11%), and agriculture (10%). Cane field burning and bagasse incineration contributed 70% of the particulate matter, with solid waste disposal as the next largest source (17%). Motor vehicles, mainly automobiles, accounted for 58% of the CO emissions, with agriculture and solid waste disposal contributing 23 and 15%, respectively. The three largest sources of hydrocarbons were motor vehicles (40%), solid waste disposal (28%), and evaporative losses (21%). Motor vehicles and steam-electric utilities were the predominant sources of NOx, contributing 28 and 27%, respectively. Other transportation (aircraft and vessels) and stationary fuel combustion sources accounted for 14%, and open burning contributed 17%. (Author summary modified)

23013 APTIC NO. 42667

Nakamura, R.

DEVELOPMENT OF FUEL BATTERY FOR ELECTRIC AUTOMOBILE. *(Denki jidosha yo nenryo denchi no kaihatsu doko). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 11(122):51-56, April 1972.*

The construction of a fuel battery and specifications of a fuel battery for an electric automobile are discussed. Theoretically calculated, a hydrogen-oxygen fuel battery is required to spare only 5 W out of its 1 KW output for operation of its circulation system. Due to poor efficiency of small-sized pumps and motors used in the system, however, the fuel battery developed by Japan Battery a few years ago actually needed 250 W/KW power to operate the circulation system. The ratio has been improved to 30 W/KW in the fuel battery with 10 KW output recently developed by Japan Battery. Also discussed is the i-V characteristic of oxygen- hydrogen fuel battery. With current density set at 8 A/sq cm for constant driving, the Japan Battery electric car equipped with a lead battery has the battery voltage of 69.3 V when in constant speed driving. This voltage can be supplied by 85 cells of oxygen- hydrogen batteries (each cell known to give 0.815 V under the same condition). Whereas the lead battery still gives 64.6 V when a discharge of 200 A is required to start the car, the fuel battery is subject to a voltage drop under the same condition, giving only 59.5 V. To solve this problem, a hybrid type consisting of storage battery and fuel battery has been developed. The problem involves a fuel battery to be mounted in a car is its volume. The volume of the oxygen-hydrogen battery (consisting of cells only) is about 47% of equivalent lead acid battery. However, volume of fuel bombs (containers) and the circulation system should be added to this. In this respect, the hydrogen-air fuel battery is advantageous in that it needs no oxygen bomb, reducing the volume that much.

23014 APTIC NO. 42980

Norbye, J. P.

THE WANKEL ENGINE--AN EVALUATION OF ITS POTENTIAL. *Preprint, American Society of Mechanical Engineers, New York, 12p., 1972. (Presented at the American Society of Mechanical Engineers, Design Engineering Conference and Show, Chicago, Ill., May 8-11, 1972, ASME Paper 72-DE-33.)*

Lower cost, lower weight, less bulk, and cleaner emissions are some of the reasons why the Wankel engine, which is a rotary type of internal combustion engine, will replace the V-8 in many applications. Its compactness facilitates installation and makes for improved space utilization in the vehicle -- offering greater opportunities for new vehicle concepts. It has far fewer parts than the piston engine, and since it has no reciprocating parts, it is practically free of vibration. It has about twice the power-to-weight ratio of a V-8 engine. The Wankel engine supplies power for about 2/3 of its combustion phase, against only 1/4 in the piston engine. It can digest low octane lead-free fuel without loss of power or economy, and is uncritical of lube oil quality. The design lends itself well to automated manufacture and assembly. The advantages of the Wankel engine as a power source for automobiles are considered. (Author abstract modified)

23015 APTIC NO. 42666

Ogawa, D.

A ROUNDUP ON DEVELOPMENT OF NON-POLLUTION AUTOMOBILES. *(Mukogai jidosha kaihatsu no ikisatsu). Text in Japanese. Jidosha to Seibi (Automob. Maint.), 26(5):109-113, April 1972.*

Pollution-free automobiles are being developed. Most typical is an electricity-driven type. However, the problem of electric power generation will arise should all automobiles become electricity driven. If all of the 17 million automobiles operating in Japan as of the end of last year are each equipped with a 20 KW motor and operated with electric power, 340 million KW or 7 times Japan's present power generation capacity is needed. To provide such a huge quantity of electric power without incurring environmental pollution, Japan should take advantage of its geographical location and explore wind and hydraulic power generation. Several types of electric cars are discussed. A new type of steam engine uses hydrogen fluoride instead of water. The Nice Engine, a 2-cycle (U-shaped) engine is discussed which reduces fuel consumption by 30-35%, hydrocarbons by 50%, nitrogen oxides by 20% and carbon monoxide by 90%.

23016 APTIC NO. 42671

Okubo, T.

ON DETERIORATION PHENOMENA OF STACK LINING MATERIAL OF THERMAL POWER PLANT. *(Karyoku hatsudensho entotsu uchibarizai no rekka gensho ni tsuite). Test in Japanese. Chugoku Denryoku Gijutsu Kenkyujo Giken Jiho (Chugoku Elec. Power Co., Tech. Res. Inst., Current Res. Rep.), no. 41:133-139, Feb. 1972.*

With the change of fuel to heavy oil, the stack lining usually made of isolite, fire brick, and granite is often corroded by the effects of sulfur oxides and water. Four stacks of Shinube, Onoda, and Saka thermal power plants of the Chugoku Electric Power Co. were inspected to examine the nature and degree of the corrosion. One of the four stacks inspected was a ferro-concrete stack lined with isolite bricks and measuring 4.7-7.5 m in inner diameter and 75 m in height, built in 1961. The fuel was chiefly coal up to Feb. 1970 and heavy oil thereafter. The inspection revealed that the brick lining located between the 65 m height to the top of the stack had become extremely fragile, and the opening between the brick and concrete was filled up with white powder/paste-like substances. The concrete surface could be easily scraped off to about 1 cm depth. The concrete deeper than that remained solid. The lining in the 55-13 m range showed no abnormal appearance but the opening between the brick and concrete was filled with white substance. Surface of the concrete permitted easy scraping up to 1cm depth although the inner concrete remained solid. Samples of these deteriorated lining materials were analyzed by X-ray diffraction to identify the chemical compounds constituting them. For example, the corrosion-destroyed isolite brick lining sampled from 70 m height was 2.4 in pH (1g/H2O, 100 ml) and contained sulfur trioxide for 42.2% and other compounds including a-quartz, calcium silicate, gypsum, and potash aluminum sulfate.

23017 APTIC NO. 43162

Ortgies, Ray C.

HOW DESIGN AND OPERATION INFLUENCE CUPOLA EMISSION. *Mod. Casting, 29(6):54-56, June 1956.*

The exact amount of material discharged from the stack of a hot blast cupola with an 87-inch inner diameter was determined. The sampling kit included a small dry centrifugal cyclone cell arrangement. With a potential capacity of 3000 cfm, this equipment drew off sufficient gas for a representative sample. The first test was made at a melting rate of 13.2 tons/hr. A total of 89 lbs of dust was emitted to the atmosphere/hr. Of this amount, 58 lbs were caught by the sampler. At a 19 tons/hr melt, the dust discharge increased considerably, although only a slight emission increase was recorded. Collectance efficiency increased considerably. At the cupola full rating of 23 to 26 tons, the total dust discharge again increased, but collector efficiency remained constant. Using an 80 ft stack and 5 mph wind as a basis for calculation, theoretical dust distributions were projected in pounds in relation to particle size in microns. Previous tests on the hot blast system collector indicated dust emissions 14 lbs/hr. Assuming an efficiency of 50%, a total of 28 lbs of dust should be added to the total emission rate. A series of tests was run using the cold blast principle at 18.3 tons/hr. Almost identical results were obtained in total emissions and dust concentration. Design factors cupolas that influence cupola dust emissions are bed height, charging doors, stack height, igniters, material handling, and blower air volume.

23018 APTIC NO. 43216

Paganini, Otto and A. C. King

HIGH PLAINS COTTON GIN STUDY NOVEMBER 13-17, 1967. *Texas State Dept. of Health, Austin, Air Pollution Control Program, National Center for Air Pollution Control Grant 65A-4701-SD, 61p., 1967.*

A joint air pollution emission study was made around three cotton gins in the High Plains area of Texas. High volume and fallout bucket type air samples were collected at a fixed distance from the gins in order to determine the amount of total suspended particulate matter and settleable material that resulted from operations at the gins. Information was obtained as to the type of gin, ginning capacity, seed-cotton and process weight of the material handled, bales of cotton ginned, seed produced, and trash collection and handling systems. Wind speed and direction, and soil and surface conditions around the gins were determined. Only one gin did not meet the emission standards of the Clean Air Act of Texas, and it was only 0.5% low. The nature of the soil in the area, lack of paved streets in some areas around the gins, sampler location, dust and gin trash on the streets, and traffic in the area contributed to the high upwind samples found during daylight hours. High downwind air samples are attributed to: lack of proper and adequate dust collection and trapping equipment at some gins; unprotected truck loading areas under elevated trash storage hoppers; dry loose soil and gin trash in the gin yard; leaking and fugitive losses from pneumatic collection and conveyance systems; and plugging of collectors used to remove dust, trash, and lint from the conveying air stream. Several recommendations are made to prevent dust and lint fly losses to the community atmosphere.

23019 **APTIC NO. 43302**

Pagni, Patrick J.

QUANTIFIED PRESCRIBED BURNING. *Preprint, Combustion Institute, Western States Section, 30p., 1972. 6 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-14.)*

Measurements of fuel properties, flame characteristics, and weather conditions at three range-improvement prescribed burns were made. An analytical model for steady state flame propagation through a thermally thin, porous fuel bed is discussed. An attempt to quantitatively describe flame spread in prescribed burns so that fire behavior may be accurately predicted is presented. Measurements were reported for the following fuel and terrain parameters: fuel loading, density, size, surface to value ratio, moisture content, ground slope, air temperature, humidity, and wind velocity. Flame propagation rate geometry, height, and temperature were also included. The burned area was reexamined after the fire. In addition, an analysis of flame spread under conditions applicable to prescribed burns was summarized. The rate of energy transfer from the combustion zone to the fuel was assumed to control the rate of flame propagation. Energy transfer mechanisms considered were flame and ember radiation, surface and internal convection, turbulent diffusion of flame eddies, and gas phase conduction. The effects of ambient flow, fuel moisture, fuel bed slope and endothermic pyrolysis were included. A nondimensional flame spread velocity was obtained as a function of nondimensional fuel, flame and ambient flow properties. In the case of ambient flow in the direction of flame propagation, the flame spread velocity increases exponentially with the ambient flow velocity. Excellent quantitative agreement was obtained between model predictions and both the field measurements described here and laboratory data available in the literature.

23020 **APTIC NO. 43346**

Parker, Albert

ESTIMATES OF AIR POLLUTION IN THE UNITED KINGDOM IN THE YEAR 1970- 71. *Clean Air, 1(6):18-19, 1972. 1 ref.*

Energy generation and smoke and sulfur oxide emission from fuel combustion and emissions of carbon monoxide, hydrocarbons, aldehydes, nitrogen oxides, and SOx from petrol and diesel engines are estimated and tabulated for the United Kingdom in 1970-1971. Smoke and SOx concentrations generated by combustion of coal for fuel in domestic heating, railways, coal mining, electric power stations, coke ovens, the gas supply industry, carbonization plants, and fuel plants equaled 0.72 and 3.40 million metric tons, respectively. Coke combustion for domestic and industrial sources contributed 0.17 million metric ton of SOx. The use of oil for power sources in domestic, industrial, and commercial sources, the gas supply industry, road transport, railways, and marine craft resulted in emissions of 6.07 million metric tons of SOx. Equivalents for hydro-electricity, nuclear power generation, and natural gas are included. Petrol and diesel engines, respectively, emitted 6.7 and 0.11 million tons of CO; 0.34 and 0.021 million tons of hydrocarbons; 0.01 and 0.003 million tons of aldehydes; 0.23 and 0.07 million tons of NOx; and 0.025 and 0.04 million tons of SOx. The amount of lead in the compounds discharged in exhaust gases from petrol engines was estimated at about 6000 tons.

23021 **APTIC NO. 43606**

Paullin, Robert L.

AVIATION AND ENVIRONMENTAL QUALITY. *Preprint, American Inst. of Aeronautics and Astronautics, Ner York, and Society of Automotive Engineers, Inc., New York, 6p., 1971. 2 refs. (Presented at the American Institute of Aeronautics and Astronautics, Society of Automotive Engineers, Propulsion Joint Specialist Conference, 7th, Salt Lake City, Utah, June 14-18, 1971, AIAA Paper 71-729.)*

The Society of Automotive Engineers/Department of Transportation Conference on Aircraft and the Environment, held in Washington, D. C., February 8-10, 1971, brought together for the first time those parties interested in problems associated with the environment, generated by aircraft and airports. The sources and reduction of airport-aircraft noise are mentioned, including regulatory/legal aspects of noise. Sources, distribution, effects, and legal aspects of air pollution are also indicated. Early environmental planning is recommended for the airport if it is to be compatible with its surroundings. Citizen involvement is essential, and land use planning must have strong political support to succeed. (Author abstract modified)

23022 **APTIC NO. 42756**

Pefley, R. K., M. A. Saad, M. A. Sweeney, J. D. Kilgroe, and R. E. Fitch

STUDY OF DECOMPOSED METHANOL AS A LOW EMISSION FUEL. (FINAL REPORT). *Santa Clara Univ., Calif., Engineering and Applied Science Research, Office of Air Programs Contract EHS 70-118, 102p., April 30, 1971. 17 refs.*

NTIS: PB 202732

Blends of pure and decomposed methanol were evaluated as fuels for reducing internal combustion engine air pollution, including laboratory engine tests and analysis and a preliminary design study of possible methanol decomposition chambers with associated air-fuel ratio controls. Engine test variables were air-fuel ratio, percentage methanol dissociation, compression ratio, spark advance, and intake manifold temper[illegible] Instrumentation consisted of apparatus for measuring [illegible] and fuel flow rates, engine load, engine emissions, including carbon monoxide, carbon dioxide, oxygen, and nitrogen oxide gas analyzers and a flame ionization detector, and engine temperature. The engine operated easily on fuel blends from pure methanol to completely dissociated methanols over air-fuel ratio ranges of 5:1-9:1 and compression ratio ranges within 8.5:1-10.9:1. Major unreacted emissions included CO, NOx, methanol, methane, formaldehyde, and acetaldehyde, with low concentrations of ethane, propane, and an unknown hydrocarbon. The use of dissociated methanol reduced overall emissions (NOx excepted) and resulted in shifts in the relative concentrations of the major species. Engine variables, particularly air-fuel ratio and spark advance, affected exhaust emissions in a manner similar to that for gasoline-fueled engines. Test results with the decomposition chamber and recommendations for design and operation modifications and testing are included.

23023 **APTIC NO. 43284**

Pinckney, Paul

SMOKE NUISANCE OF THE PROPOSED BADEN SMELTER. *San Mateo County Home Protective Assoc., Calif., Papers on Smelter Smoke, p. 1-11, 1907.*

Information is presented on the characteristics of smelter fumes and the damage they cause in adjacent areas as an argument against the establishment of a copper smelter in Baden, Calif. The major pollutants emitted by such a smelter are sulfur dioxide and suspended arsenic particles. Small quantities of arsenic seriously affect animal tissues, and repeated SO2 exposures will destroy plant life. It is estimated that the smelter will release 20 tons of arsenic/day and 1500 tons of SO2/day. Several law suits filed against smelters by farmers from adjacent areas are discussed. The smelter at Baden is expected to exert immediate destructive effects on vegetation and animal life for at least 15 miles in all directions, and the consequences will be directly or indirectly apparent over the entire peninsula and a wide area on the opposite side of the bay. The control methods proposed by the smelter company would remove the arsenic and sulfur from the fumes before they are released into the atmosphere. However, these measures would be used only when the wind is blowing in a southerly direction. It is concluded that the only acceptable control method is the removal of the smelter.

23024 APTIC NO. 42326

Popov, V. A.

HYGIENIC EVALUATION OF NITROGEN OXIDES AS ATMOSPHERIC POLLUTANTS. *(K gigiyenicheskoy otsenke okislov azota kak atmosfernykh zgryazniteley). Text in Russian. Gigiena i Sanit., 37(5):77-81, July 1972. 15 refs.*

Problems of the air pollution due to nitrogen oxides (nitrogen dioxide and nitric oxide) and related investigations are reviewed. Combustion, primarily of natural gas, and transportation are the basic sources of nitrogen oxides emissions. Nitrogen oxides in the presence of hydrocarbons form ozone, oxidants, peroxyacyl nitrates, aldehydes, and free radicals in photochemical reactions. Models of such photochemical reactions have been developed to forecast the probability of maximum possible oxidant concentrations from previously measured nitrogen oxides and hydrocarbons concentrations. Laboratory experiments have revealed that reduced nitrogen oxides concentrations do not always entail decreases in the oxidant level. Reducing nitrogen oxides emissions is the basic means of decreasing the oxidant levels. Principles of NO and NO2 determination are outlined. While correlation spectroscopy, infrared spectrometry, gas chromatography, and electrochemical methods are not used widely, automatic analysis is mostly based on the Griess-Saltzman colorimetric method, and chemiluminescence methods have been recently suggested. While the NO concentrations have their maximum during winter and the morning rush hours in cities, the NO2 concentrations have no distinct seasonal variations. Phytotoxic effects of nitrogen oxides as well as relationship between high nitrogen oxides concentrations and the incidence of different respiratory troubles, and also certain defense reactions of the organism have been observed.

23025 APTIC NO. 43308

Prakash, C. B. and F. E. Murray

STUDIES ON AIR EMISSIONS FROM THE COMBUSTION OF WOOD-WASTE. *Preprint, Combustion Institute, Western States Section, 29p., 1972. 9 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-1.)*

Experiments, under controlled conditions, were conducted on the combustion of wood waste to establish the effects of process variables on the emission of air pollutants. Temperature in the combustion zone was the most important parameter affecting the combustion process and associated air pollutants. The amounts of air pollutants were minimal at combustion zone temperatures greater than 1100 F. The hydrocarbons present in aerosol form in the exhaust gases were identified as abiatic acid and stearic acid. The gaseous hydrocarbon in the exhaust gases was mostly methane. The average combustion rate increased with increasing combustion zone temperature, with decreasing moisture content in the fuel, with increasing total air flow rate, and with decreasing secondary to primary air ratio. The particle size in the wood-waste and the type of the grate were also important variables for the combustion process.

23026 APTIC NO. 43633

Pratt, D. T., B. R. Bowman, and C. T. Crowe

PREDICTION OF NITRIC OXIDE FORMATION IN TURBOJET ENGINES BY PSR ANALYSIS. *Preprint, American Inst. of Aeronautics and Astronautics, New York, and Society of Automotive Engineers, Inc., New York, 14p., 1971. 32 refs. (Presented at the American Institute of Aeronautics and Astronautics, Society of Automotive Engineers, Propulsion Joint Specialist Conference, 7th, Salt Lake City, Utah, June 14-18, 1971, AIAA Paper 71-713.)*

The primary zone of a gas turbine combustor is modelled as an adiabatic, micromixed, perfectly-stirred reactor, followed by a plug-flow reactor with distributed mass addition to simulate the secondary zone. A complete reaction mechanism is employed for the combustion of premixed gaseous methane and air, since the concept of pre-flame and post-flame reactions are not applicable to micromixed, perfectly-stirred reactors or homogeneous volume burning. Combustor geometries and operating conditions representative of current aircraft engines are assumed. Predicted nitric oxide levels are compared with experimental values obtained from the literature, and with predicted levels from more complex models. At design point operation, the micromixed, perfectly stirred reactor model predicts NO concentrations as well as or better than more complex models. (Author abstract modified)

23027 APTIC NO. 42356

Ranke, Gerhard

THE RECTISOL PROCESS--FOR THE SELECTIVE REMOVAL OF CO2 AND SULFUR COMPOUNDS FROM INDUSTRIAL GASES. *Chem. Economy Eng. Rev., 4(5):25- 31, May 1972. 6 refs.*

The applicability to various industrial needs of the Rectisol process is described. Methanol, the solvent normally used in the Rectisol process, meets most of the requirements of the ideal physical solvent. Optimal working ranges are presented for chemical absorption and Rectisol wash with regard to feedgas rate, pressure, carbon dioxide content, hydrogen sulfide and carbonyl sulfide removal, purity of washed gas, purity of off-gas, and impurities in washed gas from solvent. The utilization of the Rectisol process in several different types of removal situations are described. They include simultaneous removal of CO2 and H2S, without concentration of sulfur compounds; Rectisol plus liquid nitrogen wash for treatment of ammonia-synthesis gas; purification of hydrogen from partial oxidation with separate H2S concentration; separate removal of H2S and CO2 combined with carbon monoxide shift conversion; and purification of natural gas. Rectisol is more economical than chemical absorption in high-pressure partial oxidation processes for the production of hydrogen or synthesis gases, where both H2S and CO2 have to be removed and disposed of separately.

23028 APTIC NO. 43347

Rasmussen, Reinhold A.

WHAT DO THE HYDROCARBONS FROM TREES CONTRIBUTE TO AIR POLLUTION? J. Air Pollution Control Assoc., 22(7):537-543, July 1972. 26 refs.

The source and quantity of two terpene hydrocarbons, isoprene and alpha-pinene, which are emitted from intact uncrushed plant foliage under natural conditions were investigated to determine the dominant forest type tree types related to the compounds emitted, the emission rates of selected plant species, and the potential contribution of the foliar emissions to the hydrocarbon load of global and the U. S. continental air masses. The rate of emission of isoprene was light dependent and ranged within 0.04-2.4 ppb/cm sq/min/l for oak, cottonwood, and eucalyptus foliage. The rate of emission of alpha and beta-pinene and limonene was dependent on the rate of transpiration, structural integrity of the oil cells and resin glands, and temperature of the foliage. Emission rates for conifer foliage ranged within 0.4-3.5 ppb/g/min/l. The lowest value for a specific forest type that emitted terpenes to the atmosphere was 15%. More commonly, 100% of the trees of a given forest type emitted terpenes; an average of 70% is typical of the U. S. forested regions. The annual contribution of forest hydrocarbon emissions to the air pollution problem on a global basis was 175 times 10 to the 6th tons of reactive hydrocarbons as compared to 27 times 10 to the 6th tons from human activities, i.e., a calculated 6.2-fold greater emission level. (Author abstract modified)

23029 APTIC NO. 43507

Reimer, Hans and Theo Rossi

HYDROCHLORIC ACID EMISSIONS FROM COMMUNAL WASTE INCINERATOR PLANTS. *(Zur Emission von Chlorwasserstoff bei der Verbrennung von Hausmuell). Text in German. Muell Abfall, 2(3):71-74, Sept. 1970. 2 refs.*

Communal waste charges with different proportions of polyvinyl chlorides (PVC) (2-10%) were incinerated in a 8 ton/hr capacity incinerator to determine a maximum allowable PVC content with regard to hydrochloric acid emissions. A relationship between chloride contents in fly ash and slag and waste PVC content was established. A nearly linear relationship between the HCl concentration in waste gases and waste PVC content was found. The PVC content in domestic waste, relatively low with 2-3% by weight, had more than doubled since 1960. Such proportions cannot give rise to HCl concentrations reaching or exceeding the maximum allowable limits, and a safety factor of 8-10 is available, instead. The corresponding safety factor for actual hydrofluoric acid emissions lies, however, at 5 only. Scrubbing, though expensive, represents at the present time the only means to remove HCl from incinerator waste gases. Scrubbers may also replace electrostatic filters.

23030 APTIC NO. 42446

Roberts, Richard, Leonard D. Aceto, Reiner Kollrack, John M. Bonnell, and Donald P. Teixeira

AN ANALYTICAL MODEL FOR NITRIC OXIDE FORMATION IN A GAS TURBINE COMBUSTION CHAMBER. *Preprint, American Inst. of Aeronautics and Astronautics, New York, and Society of Automotive Engineers, Inc., New York, 10p., 1971. 28 refs. (Presented at the American Institute of Aeronautics and Astronautics Society of Automotive Engineers, Propulsion Joint Specialist Conference, 7th, Salt Lake City, Utah, June 14-18, 1971, AIAA Paper 71-715.)*

An analytical model was developed for predicting the influence of combustor geometry and operating conditions on gas turbine nitric oxide emissions. The principal elements of the analysis are a three-zone internal flowfield model, a fuel droplet burning model incorporating either equilibrium or kinetic rate-limited hydrocarbon thermochemistry, and a treatment of the kinetics of nitric oxide formation. The postulated controlling mechanisms are incorporated using a numerical integration procedure coupled to the combustor flowfield. The assumption of equilibrium hydrocarbon chemistry is concluded to be adequate for predicting nitric oxide concentration. Parametric results are presented indicating the influence of variations in primary zone equivalence ratio, combustor residence time, and initial fuel droplet size. The influence of a particular combustor modification is directly related to changes in the vapor phase fuel-air distribution within the combustor. (Author abstract modified)

23031 APTIC NO. 42904

Robson, F. L. and A. J. Giramonti

NONPOLLUTING CENTRAL POWER STATIONS. *Advan. Astronaut. Sci. Suppl., vol. 26:29-37, 1971. 8 refs. (Presented at the American Astronautical Society and the American Institute of Aeronautics and Astronautics, Special Technical Event, Winrock, Ark., Oct. 30, 1970, Paper AAS70-083.)*

Advanced-cycle power systems, based on aerospace technology developed for use in aircraft gas turbines, have the potential of lowering the cost of base-load electric utility power while reducing the emissions of sulfur oxides from fossil-fueled power stations. Desulfurized fuels are suitable for use in advanced cycle power systems, which could operate at efficiencies significantly higher than those projected for conventional steam power stations. One of the most promising advanced-cycle power systems consists of a combined gas turbine-steam turbine (COGAS) system where the hot exhaust of the gas turbine is used to raise steam in an unfired waste-heat recovery boiler. The gas turbine would be an evolution of current turbomachinery and would use aerodynamic and blade cooling concepts and blade materials which are now used or proposed for use in advanced aircraft gas turbines. Approximately 2/3 of the power output would come from the gas turbine and 1/3 from the steam turbine. Using technology judged to be available by 1980, the COGAS system could achieve overall station efficiencies of approximately 55%. An economic analysis of the entire advanced-cycle system, including the fuel processing plant, is presented. The results indicate that the cost of power at the station busbar can be reduced by as much as 15% in comparison with the cost of power from projected conventional steam power stations. Also, stack emissions of sulfur oxides can be substantially reduced. (Author abstract modified)

23032 APTIC NO. 43483

Saburo, Aburai and Onishi Shigeru

STUDY OF NEW TYPE TWO STROKE CYCLE STRATIFIED CHARGE ENGINES. *(Shim-hoshiki nisaijuru seiso kyuki ejin no kenkyu). Nainen Kikan (Internal Combust. Engine), 8(85):11-21, June 1969. 12 refs. Translated from Japanese. 39p.*

The application of the stratified charge system of two cycle gasoline engines has fundamentally improved their performance and opened up a new area in piston engines. With the stratifed charge system it is possible to inhibit to a considerable degree all three pollutants in automobile exhaust gas: carbon monoxide, hydrocarbons, and nitrogen oxides. All three can be simultaneously inhibited without adding any attachments. The fuel consumption ratio of the new engine at partial load is especially good, and compression ratio is better than that of four stroke cycle gasoline engines. There is almost no irregular, out-of-adjustment operation based on misaligned combustion cycles when there is no load or a light load. Operation is quiet and smooth, and there are no problems with cold starting. There are none of the critical controls which tended to occur in stratified charge engines in the past, nor are there any smoke limits. The engines also show promise for possible use as multi-fuel engines. Experimental and developmental work is described.

23033 APTIC NO. 42731

Safonov, V. N., V. A. Limanskii, V. P. Klyushkin, E. G. Levkov, N. G. Bulgakova, G. I. Il inskaya, N. A. Borisenko, and A. S. Levkova

THE PHYSICAL PROPERTIES AND CHEMICAL COMPOSITION OF DUST FORMED DURING THE PRODUCTION OF ALUMINUM AND SILUMIN. *Tsvetn. Metal., 44(4):42-44, 1971. 12 refs. Translated from Russian. Trans-Chem, Inc., Knoxville, Tenn., 6p.*

The physical properties and chemical composition of dust have a significant effect on the basic operating character of dust removal devices, and these determine the expediency of using a specific type of dust removal system. Hence, methods for the determination of physical properties and chemical composition of dusts are reviewed. The dispersion of dust particles by particle size at four different plant locations was determined by methods of three dust extractors and an impactor (a multistage jet precipitator). Both methods measure the dispersion of dust particles directly in a gas conduit; the latter, however, gives more reliable results. For measuring the specific electrical resistance of electrolyzer and silumin dust, a device was used in which a dust layer is formed between two filtering surfaces under conditions found in a gas conduit. An advantage of this method for forming the dust layer lies in the fact that it is not necessary to measure the thickness of the dust layer, since it is always constant and equal to the distance between the discs. Regarding chemical composition, fluorine components are of special interest since they are harmful to the attendant personnel as well as being valuable components. Fluorine which is tied up in the form of complex fluorides was determined by a gravimetric method on lead fluorochloride and also by a mercurous and mercuric method using diphenyl carbazone as an indicator. Results are also given for the fluorine determination by a thorium method using alizarin red S as an indicator. Aluminum, calcium, and magnesium were determined by complexometric methods. Silicon was determined photometrically by the dark blue silicomolybdenum complex with elimination of the interference of fluoride ion by boric acid. The basic method for determining the resinous material requires the extraction of polynuclear aromatics with non-fluorescing benzene and then measuring the fluorescence of the extracts. Iron was determined by an orthophenanthroline method after the fluorine was extracted by fusing with potassium pyrosulfate.

23034 APTIC NO. 42914

Sanders, C. F., D. P. Teixeira, and N. Bayard de Volo

THE EFFECT OF DROPLET COMBUSTION ON NITRIC OXIDE EMISSIONS BY OIL FLAMES. *Preprint, Combustion Institute, Western States Section, 22p., 1972. 7 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 14-25, 1972, Paper WSCI 72-7.)*

As part of a continuing program to reduce emissions, single droplet combustion was examined to determine the importance of that mechanism to the formation of nitric oxide in utility boiler oil flames. The model of Lorell, Wise, and Carr was used to predict the temperature and concentration fields around the drop. The emission index, defined as the rate of nitric oxide formation divided by the rate of fuel vaporization was directly proportional to the square of the drop diameter. The simple relationship between emission index and drop size was used to determine the total nitric oxide produced by a drop size distribution under conditions typical in oil-fired furnaces. In addition, a series of five tests to study the effect of drop size were run in a Southern California Edison utility boiler. The results of the plant test and the analytical calculations indicate that single droplet burning is not important in utility boilers.

23035 APTIC NO. 43430

Schoeppel, Roger J.

DESIGN CRITERIA FOR HYDROGEN BURNING ENGINES. (FINAL REPORT). *Oklahoma State Univ., Stillwater, School of Mechanical and Aerospace Engineering, Office of Air Programs Contract EHS 70-103, APTD-0901, 156p., Oct. 1971. 15 refs.*

NTIS: PB 205815

Laboratory experiments have demonstrated hydrogen not only to be an excellent substitute for conventional hydrocarbon fuels in internal combustion engines but also to have the inherent qualities necessary for a permanent solution to the air pollution problem. This conclusion was reached after extensive tests were conducted with an air-cooled single-cylinder gasoline engine converted to run on hydrogen. The engine s operational characteristics compared favorable with those of its gasoline counterpart. Furthermore, the NOx content of the exhaust was an order of magnitude lower than that expected from a gasoline engine. Trace amounts of unburned hydrocarbons and carbon oxides, also present, originated from the lubricating oil. A multi-cylinder automotive engine converted to run on hydrogen should be able to meet the 1975/76 Federal Emission Standards.

23036 APTIC NO. 43403

Stoiber, Richard E. and William I. Rose, Jr.

THE GEOCHEMISTRY OF CENTRAL AMERICAN VOLCANIC GAS CONDENSATES. *Geol. Soc. Am. Bull., 81(10):2891-2912, Oct. 1970. 49 refs.*

Chemical data on fumarolic exhalation from high-temperature fumaroles were obtained from 132 gas condensates sampled at six Central American volcanoes. The data are from sufficiently varied locations and cover a long enough time span to permit generalizations regarding the variations in quantity of the seven components for which analyses were made, namely, chlorine, fluorine, sulfate radical, calcium, magnesium, sodium, and potassium. Fumaroles on lava flows have chloride-rich emanations, and fumaroles at active central vents have high SO4. Quantitative data suggest decrease of Cl/SO4 ratio at fumaroles at or near active vents before an eruptive period and a rise in the ratio afterward. Regular observations of trends of Cl/SO4 in condensates from high-temperature fumaroes near central vents appear to allow prediction of the onset of a new eruptive period. The seasonal rains in Central America aid in confirming the effect of groundwater dilution on concentration. Cl and F concentrations and Cl/F, unlike SO4 or Cl/SO4, are time and temperature dependent. Changes in concentration with time or temperature appear due to increased ground-water dilution, reduction in the volume of chlorine from the magmatic source with time and, for F, extraction by reaction with the wallrock. Alkalis and alkaline earths appear to be the products of reaction with the wallrock. Part of the K and Na, whose chlorides, unlike those of Ca and Mg, are volatile, appears to have a magmatic source. Estimates of the Na/K ratios in emanations from basaltic to dacitic magma cover a range of 0.5 to 3.0. Suggestions are made for improved data collection when an appropriate opportunity is offered. (Author summary modified)

23037 APTIC NO. 43230

Tubich, George E.

THE MODERN FOUNDRY ENVIRONMENT. *Am. Ind. Hyg. Assoc. J., 24(2):127-130, March-April 1963. (Presented at the American Conference of Governmental Industrial Hygienists, Annual Meeting, Washington, D. C., May 1962.)*

Changing times and technology have introduced many new processes and materials into the foundry industry. Some of the new developments have brought new potentials for hazards to the health of foundry workers. Considerable use is made of urethane, polyester, and epoxy resins for fabrication of a wide variety and sizes of patterns. Improper gassing pressures and failure of gas applicator valves have resulted in the workers hands being frozen to the applicators in carbon dioxide molding operations. Significant hazards of dust, solvent vapor, gases, and dermatitis exist with shell molding, while a serious silica hazard exists in the investment casting process. Other problems exist with core binders, mold materials, radioisotopes, solvents, casting grinding, and developments for improving the metallurgical characteristic of metals. There have been many instances of explosions from residues, coatings, or activated surfaces on a variety of metals. The principle of low-volume high-velocity ventilation has merit on

operations such as portable grinding, chipping, and decoring. (Author abstract modified)

23038 APTIC NO. 43628

Venezia, Ronald A. and Edward Edgerley, Jr.

THE IMPACT OF CHANGES IN URBAN TRANSPORTATION SYSTEMS ON AIR QUALITY. *Preprint, American Inst. of Chemical Engineers, New York, N. Y., 32p., 1972. 9 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 72nd, St. Louis, Mo., May 21-24, 1972, Paper 11d.)*

A model was developed to quantify the impact of transportation alternatives on ambient air quality. It predicts the maximum pollutant concentration expected to occur more than once a year. The model was tested using part of the proposed mass transit system for the St. Louis region. Calculated levels of carbon monoxide and hydrocarbons compared well with measured data over the short term. Projections for 1990 showed that only very slight improvements in ambient CO would result from the improved mass transit. Hydrocarbon emissions in 1990 will not be affected by the transportation industry at all, providing the automotive controls work as planned.

23039 APTIC NO. 43182

Venstrom, Cruz, Marvin Hyman, and Laurence Caretto

SAN FRANCISCO BAY AREA AIR POLLUTION. *Preprint, Northern California Committee for Environmental Information, Berkeley, Calif., 19p., 1969.*

On the usual Bay Area sunny day the air is calm and capped by a warm layer inversion at 500 or 1000 ft altitude. Ventilating cool offshore air comes slowly through the Golden Gate gap, and splits against the Berkeley hills, with one portion flowing eas through the Carquinez Straight, carrying pollutants from the Richmond industrial area to the central valley. At times there is an appreciable drift around Mt. Diablo to the Livermore area. The other portion, deflected southeastward, flows, in part, out Niles and Dublin Canyons, past Livermore to the east. A portion flows over and past San Jose and out of the Bay Basin beyond Morgan hill. This gentle, regular flow pattern causes the greatest intensity of smog in southern Alameda County, in Livermore Valley, and in the southern part of the Bay Basin. Relative freedom is enjoyed near the ocean and in the northern Berkeley hills on most days. Total particulates for the six county Bay area amount to 201 t/day including natural sources thought to amounts to 40-100 t/day. Organic compounds, principally unburned fuel amounts to 1899 t/day. Nitrogen oxides amount to 564 t/day. Sulfur oxides amount to 351 t/day. Carbon monoxide amounts to 6164 t/day. Automobiles are thought to be responsible for 72% of the 1969 average of 9179 t/day total pollutants emitted into the atmosphere. A history of air management in the Bay Area is included as well as present standards and expectations for the future. A course of action is envisioned and proposals are made to meet what is appraised as a chronic air pollution emergency. Discussion of alternative transportation facilities and alternatives to the gasoline engine are included.

23040 APTIC NO. 43332

Voelz, F. L., E. W. Onyon, R. M. Oust, W. C. Rusnack, J. S. Segal, and B. G. Gower

SURVEY OF NATIONWIDE AUTOMOTIVE EXHAUST EMISSIONS AND PCV SYSTEM CONDITIONS: SUMMER 1970. *Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1971. 7 refs. (Presented at the Society of Automotive Engineers, National Combined Fuels and Lubricants, Powerplant and Truck Meetings, St. Louis, Mo., Oct. 26-29, 1971, Paper 710834.)*

During the summer of 1970, the Atlantic Richfield Co. conducted a nationwide automotive exhaust emissions testing program known as the Clean Air Caravan. The program was designed to show motorists their automobile engine emission levels and to emphasize the need for keeping their engines properly maintained to reduce exhaust pollution. More than 75,000 vehicles were tested in 15 metropolitan areas. Hydrocarbon and carbon monoxide emissions were recorded at idle and 2500 rpm for each vehicle, and the condition of the positive crankcase ventilation was correlated with vehicle age. Average emissions for the domestic manufactured vehicles were: 290 ppm HC and 2.0% CO at 2500 rpm, and 520 ppm HC and 4.0% CO at idle. The averages for the foreign-origin vehicles were 300 ppm HC and 3.0% CO at 2500 rpm, and 700 ppm HC and 4.0% CO at idle. Of the total vehicles tested, 32% were given carburetor adjustments; these adjustments had the following effect on emission levels: idle HC emissions were reduced from 556 to 430 ppm, a 23% reduction, while idle CO emissions were reduced from 5.7 to 3.1%, a 46% reduction. Based on Clean Air Caravan guidelines for idle CO, it can be projected that more than 40 million automobiles need a carburetor adjustment.

23041 APTIC NO. 42315

Wade, Wallace R.

COMBUSTION APPARATUS. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,656,298. 5p., April 18, 1972. 5 refs. (Appl. Nov. 27, 1970, 5 claims).*

A gas turbine combustion apparatus is described which comprises a cylindrical combustion liner with a dome through which primary combustion air is admitted in part. Film cooling air is admitted between the dome and the side wall to flow along the side wall. Additional primary combustion air is admitted through devices which mix the air with some combustion products, the resulting mixture being cooled in part by the combustion liner film cooling air. The result is to dilute oxygen at the flame and lower combustion temperatures, therefore minimizing formation of oxides of nitrogen. (Author abstract modified)

23042 APTIC NO. 43210

Wadleigh, Cecil H.

WASTES IN RELATION TO AGRICULTURE AND FORESTRY. *U. S. Dept Agri., Misc. Publ., no. 1065:1-112, March 1968. 129 refs.*

Ten catagories of pollutants that contaminate the air, water, and soil in relation to agricultural and forestry endeavor are discussed. The catagories are radioactive substances, chemical air pollutants, airborne dusts, sediments, plant nutrients, inorganic salts and minerals, organic wastes, infectious agents and allergens, agricultural and industrial chemicals, and heat. An economic evaluation of the above is presented. Adverse effects of wastes from agriculture and forestry are discussed. Research toward reduction of waste production is reviewed. Problems of waste management and control are brought into focus.

23043 APTIC NO. 43340

Walther, Eric G.

A RATING OF THE MAJOR AIR POLLUTANTS AND THEIR SOURCES BY EFFECT. *J. Air Pollution Control Assoc., 22(5):352-355, May 1972. 6 refs.*

The available national annual air pollution emissions are based on mass. Different air pollutants have different toxicities per unit mass, hence the emissions should be rated by effect, not by mass, so that more sensible priorities can be set in control research and regulation. Effect factors are derived from the health effect literature indirectly by using the national primary and secondary ambient air quality standards for carbon monoxide, hydrocarbons, aerosols, nitrogen oxides, and sulfur oxides. The resulting analysis shows transportation to be still the largest source as it is in the mass analysis, while hydrocarbons become the largest pollutants by effect compared to carbon monoxide being the largest pollutant by mass. Stationary fuel combustion drops to fourth place, compared to its second place contribution by mass. Other major sources are industry and solid waste disposal.

23044 APTIC NO. 42987

Wiemer, Peter and Horst Glinka

DETERMINING THE ASH AND SULFUR DISTRIBUTION IN PIT COAL-FUELED THREE-PASS BOILERS. *(Bestimmung der Asche- und Schwefelverteilung bei Steinkohlegefeuerten Dreizugkesseln). Text in German. Forschungsber. Landes Nordrhein-Westfalen, no. 2087:1-82, 1970. 13 refs.*

Practical measurements of the ash and sulfur distribution in hearth residues and waste gases of four pit coal-fueled three-pass boilers were performed. The volatile content of the coals ranged from 20-28.5%, the ash content from 2.5-5.5%, and the sulfur content from 0.7-1.2%. The dust concentration of the waste gases was 0.25 to 2.43 g/N cu m. Some 85% of the coal ash was bound by hearth residues, while the rest was emitted. Dust collectors reduced ash emissions to 3-5% but were practically ineffective for sulfur. Between 0.23-0.50% of the total coal sulfur was bound in hearth residues and about 0.6% was bound in fly ash. The sulfur content in soot was higher than in the coal. More than 90% of the total sulfur was present in the waste gas in the form of sulfur dioxide, and a relationship between the SO2 and carbon dioxide in the waste gas was observed. Sulfur trioxide accounted for 0.2-0.8% of the total sulfur.

23045 APTIC NO. 43407

Wilks, Syrrel S.

CARBON MONOXIDE IN GREEN PLANTS. *Science, 129(3354):964-966, April 10, 1959. 8 refs.*

Green plants grown in a closed, illuminated system liberated small quantities of carbon monoxide. Similarly, finely divided powder and chlorophyll extracts of green plants, when illuminated in an environment of oxygen and water, yielded small quantities of CO as well as certain aldehydes. The CO phenomenon was not inhibited by enzyme inhibitors, including cyanides, fluorides, acids, and alkalis. The component of the light spectrum which is absorbed in photosynthesis (480-680 micron) was responsible for the CO and aldehyde formation. There is a possibility of CO asphyxiation in the proper environment of green, damaged vegetation. In any proposed human-algae closed system, provisions may have to be made to eliminate the CO evolved from the plant systems.

23046 APTIC NO. 42726

Worcester, A. and D. H. Beilstein

LEAD - PROGRESS AND PROGNOSIS. THE STATE OF THE ART - LEAD RECOVERY. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers, New York, Metallurgical Society, 22p., 1971. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 100th, New York, Feb. 26-March 4, 1971, Paper A71-87.)*

Present methods in general use to recover lead metal from its ores, including methods for sintering, heavy smelting, drossing, refining, and emissions control, are described. Baghouses and electrostatic precipitators are the most common dust and fume collectors. In some emission control operations sulfuric acid, cadmium, and thallium are recovered. Probable short and long term advances in the lead recovery process are suggested. The history of lead smelting is briefly reviewed. Lead consumption in the United States in 1970 was 1.267 million tons, distributed as chemicals: 278,000 tons; batteries: 570,000 tons; pigments: 98,000 tons; and metal: 371,000 tons.

23047 APTIC NO. 42791

Yamakawa, Tsumoru and Shigeaki Suzuki

LEADLESS GASOLINE MANUFACTURING SYSTEM. *(Muenka gasorin seizo sochi). Text in Japanese. Sangyo Kikai (Ind. Machinery), no. 258: 9-14, March 1972. 2 refs.*

Various methods of contact formation of non-leaded gasoline are discussed. For a change of gasoline quality, dehydration, paraffin hydrocarbon isomerization, isomerization and cyclic dehydration, and hydrogenation decomposition are practiced. The most important is the dehydration process. The format of dehydration is classified by the method of catalyst packing; there are the fixed bed process, the moving bed process, and the fluidized bed process. Discussion of the types of reactors presently used in Japan include (1) the IRE cyclic power forming method, (2) the magna forming method, (3) the platforming method, (4) and the reinforming method. The IRE method can control the process severity automatically and transfer the reactor without dropping the operation efficiency. The magna forming method can operate at two levels, the first at a low temperature and low cycle, and the second at a high recycle. The platforming method contains the total reaction processes in one system. The reinforming method can be operated at a lower pressure than the other methods.

CONTROL METHODS

23048 APTIC NO. 42602

Badische Anilin- und Soda- Fabrik A. G. Ludwigshafen (West Germany)

HOW CAN AIR BE MADE CLEANER? (Wie wird die Luft sauberer)? Text in German. In: Werk und Umwelt. p. 10-34, 1970 (?).

Air-pollution control measures applied at the Badische Anilin- and Soda-Fabrik are described. The pollutant emissions (dust, waste gases, vapors, and odorous substances) have decreased despite increased production, and are well below the maximum allowable levels. The sulfur dioxide emissions decreased as a result of a changeover from coal to oil and natural gas. Dust precipitation measurements revealed a low value of 0.2 g/sq m. Waste gas emissions from power plants, as well as sulfuric and nitric acid production, decreased partly due to technological improvements. Sulfur dioxide emissions, which have been stabilized at about 0.08 mg/cu m for years, will be further reduced in the near future when a nuclear power plant is put into operation. The nitrogen oxides emission in 1970 was one third the 1961 value, though the nitric acid production rose by 150%. Residual hydrocarbons are burned in central high torches, as are odorous substances such as amines and ammonia to obtain nearly odorless discharge. Systematic emission monitoring on and outside the premises, partly in cooperation with a nearby station of the nation-wide network, is conducted.

23049 APTIC NO. 42732

PROCESS FOR PREPARATION OF AN OIL WITH A LOW SULFUR CONTENT. *(Shel International Research Maatschappij N. V., The Hague (Netherlands)) Neth. Pat. Appl. 69-06560. April 20, 1969, (14 claims). Translated from Dutch. Trans-chem, Inc., Knoxville, Tenn., 16p.*

A process is discussed for preparation of an oil with a low sulfur content from a residual oil with a high sulfur content. The residual oil is separated in asphaltenes and a de-asphaltenized oil; the de-asphaltenized oil is separated into resins and a de-asphaltenized and resin-extracted oil; the de-asphaltenized and resin-extracted oil is catalytically desulfurized with hydrogen; and the desulfurized oil obtained in this way is mixed with resins. Asphaltenes are the constituents of a residual oil which are insoluble in light precipitation agents such as n-pentane. They have the appearance of a dark brown to black powder, are aromatic to a great extent, and contain condensed rings. Asphaltenes have a considerably higher sulfur content than resins; hence, by using resins exclusively for mixing with the oil desulfurized with hydrogen, an oil with low sulfur content is obtained. Burning the oil with a low sulfur content prepared with the aid of the process according to the invention therefore leads to lower air pollution.

23050 APTIC NO. 42743

Hittman Associates, Inc., Columbia, Md.

STUDY OF THE FUTURE SUPPLY OF NATURAL GAS FOR ELECTRICAL UTILITIES. *Office of Air Programs Contract EHSD-71-43, HIT-500, 43p., Feb. 1972. 33 refs.*

NTIS: PB 209285

The use of natural gas as a major fuel source is approaching a critical period. The value of reserve to production ratio has continued to drop for the past several years, reaching 13.3 in 1969. The reason given for this business posture is the unfavorable pricing structure that has existed for the past several years. As a result the new drillings have declined for lack of money. This is coupled with an ever increasing consumption rate of 20.7 trillion cu ft in 1969. Because most states have agreements with the gas utilities which set first priority to residential customers, shortages will most affect the electrical utilities. For this reason, some electric utilities in Texas and Louisiana have designed new fossil fuel plants with a dual fuel capacity. To meet the gas consumption demands of 40,000 trillion BTU forecasted for the year 2000, alternates from pipeline natural gas must be found. Liquefied natural gas will be the immediate answer, allowing significant importation from both the Far East and South America. Eventually, however, oil shale or coal gasification must be used to augment the gas supply. Coal alone could increase the potential gas reserve by over a factor of ten. The use of alternate gas supplies will force the gas prices upward making it economically unattractive for the large, base loaded utility plants. (Author summary modified)

23051 APTIC NO. 43155

(Inventor not given.)

PROCESS FOR REMOVING SULPHUR DIOXIDE FROM A GAS. *(Lummus Co., Bloomfield, N. J.) Brit. Pat. 1,160,197. 5p., July 30, 1969. (Appl. April 23, 1968, 13 claims).*

The process and operating procedure for removing sulfur dioxide from a gaseous stream are presented. Prior processes for SO2 removal were not particularly effective for removing low SO2 concentrations and did not provide for the recovery of sulfur values and the regeneration of the absorption material. The process is based on the reaction between the SO2 and a metal carbonate (sodium or calcium carbonate or dolomite) to produce the corresponding sulfite at temperatures within 250-1000 F. Sulfur trioxide present in the gas reacts with the carbonate to produce the corresponding sulfate. The sulfite is then reduced with carbon monoxide to regenerate the carbonate, to recover sulfur values, and to produce carbon dioxide. The CO2 may then be reacted with a free carbon containing material to regenerate the CO. Recommended operating variables, materials, and modifications to the process are reviewed.

23052 APTIC NO. 43194

Mill Mutual Fire Prevention Bureau, Chicago, Ill., Engineering Service Dept.

DUST CONTROL ANALYSIS AND LAYOUT PROCEDURES FOR GRAIN STORAGE AND PROCESSING PLANTS. *Bull. DC-603-2-67, 54p., 1967 (?).*

The problem of dust control is basically one of reducing the air pressure inside of machines or equipment to a level not higher than the pressure outside, or conversely, of increasing the outside pressure to a level at least as high as the inside pressure. Some relatively non-technical information is presented regarding the design and installation of dust control equipment in grain handling and processing plants. The purpose of a duct system in dust control is simply to provide connection between an exhaust fan and the various purpose points where a reduction of internal pressure is required. Duct systems, exhaust fans, cyclone collectors, volume determinations, grain velocities, elevator legs, bins and hoppers, discharge of belt conveyors, loading connections, scales, batch mixers, and dust control layouts are discussed. Dust control computations are presented.

23053 APTIC NO. 43249

DUST REMOVAL FROM FUMES EMITTED BY THE VALMOESA ELECTROMETALLURGICAL PLANT (SWITZERLAND). *(Le depoussierage des fumees a l usine electrometallurgique de la Societe VALMOESA (Suisse)). Text in French. J. Four Elec., no. 3:75-81, March 1969. 3 refs.*

Different dust separation techniques as applied at the Valmoesa electrometallurgic plant producing ferroalloys are described. venturi scrubbers, reaching hardly an efficiency of 30%, were replaced by electrostatic filters at calcium carbide, silicon, and electric arc furnaces. Two wet-type electrostatic filters, with capacities of 130,000 and 100,000 N cu m/hr, reduce the dust content in the fumes from 0.7-4.5 g/N cu m to 0.05-0.08 g/N cu m. The voltage applied to the fumes admitted in a temperature range of 135-320 C is 30-50 kV. The dust removal from the filters is made by means of water jet of 3 min every 30 min. Two glass fiber bag filters, with a capacity of 30,000 N cu m/hr each, release the fumes, cooled naturally to a maximum temperature of 120 C before admission, with a maximum residual dust content of 0.05 g/N cu m. The filters are cleaned by air jets of 30 sec duration in counterflow. The over-all efficiency of dust separation at the metallurgic plant lies at 95.5% with running costs amounting to $140/day.

23054 APTIC NO. 43263

National Coal Board, London (England), Fluidised Combustion Control Group

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSION OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED COMBUSTION OF COAL. *Office of Air Programs APTD-1082, Rept. DHB 060971, 150p., Sept. 1971. 12 refs.*

NTIS: PB 210673

The application of fluidized bed combustion systems to reduce emissions of sulfur oxides, nitrogen oxides, and particulates from coal combustion was investigated. Pilot plant combustors were used to determine the effects on emissions of coal type; quantity, size, and type of additive; bed temperature; fluidizing velocity; bed height; fines recycle; operating pressure; particle size; and plant design. The extent to which the addition of limestone or dolomite to coal in the bed influences the corrosion, erosion, and deposit formation was also investigated. A mathematical model was developed, based on the experimental data, to correlate the operating variables and pollution control characteristics of the fluidized combustion system. The combustion system and the addition of limestone controlled SOx emissions within the restrictions imposed in densely populated areas (100 ppm v/v SO2). Emissions of NOx from the pressure combustor, at 50-200 ppm, were significantly lower than from the non-pressurized combustors (300-600 ppm). All the combustors produced less NOx pollution, both with and without additives, than in conventional systems. Low combustion temperatures in the combustors resulted in low alkali emissions; most of the chlorine of the coal was released into the combustion gases. Particulate emissions were well below current restrictions. By using primary and secondary cyclones with collection efficiencies of 90% at about 10 micron, 95-98% of the particulate matter could be collected to effect dust emissions of 0.2-0.6 g/scf. The addition of limestone or dolomite had no significant effect on corrosion or deposition. (Author summary modified)

23055 APTIC NO. 43327

THIRTY-THIRD INVENTORY OF NEW PROCESSES AND TECHNOLOGY. *Chem. Eng., 79(16):129-136, July 24, 1972.*

Ninety-one important technical developments in the chemical process industries announced from November 1971 through April 1972 are reviewed. Processes are in the areas of inorganic chemicals, metals, organic chemicals, petroleum and fuels, plastics, pollution control, pulp and paper, and technology. The review of each process includes the product, the process, the user, the important features of the process, and the status of the process development. The following products and the process or equipment involved with them are reviewed in the pollution control field: adsorption; auto emissions control by catalytic conversion; flue-gas desulfurization by caustic-soda reaction; hydrogen sulfide removal by catalytic oxidation/reduction and oxidation/reduction; mercury removal by chlorination, amine reaction; mercury removal by adsorption; mercury removal by reduction; mercury-vapor recovery by chlorine/ caustic scrubbing; oil-spill prevention by gelling; phosphate removal by biological treatment; pulp-mill wastewater purification by incineration; sewage treatment by alum addition; sewage treatment by physical/chemical treatment; solid-waste disposal by high-temperature pyrolysis; solid-waste disposal by pyrolysis of garbage; sulfur dioxide recovery by scrubbing; sulfur dioxide removal by sodium-sulfite absorption; sulfur dioxide removal by sulfur recovery; sulfur oxide removal by scrubbing; wastewater purification by freezing; wastewater treatment by chemical coagulation and air flotation, liquid-membrane process, and phosphate precipitation; water-pollution control by recycling; water purification by coalescing; and water purification by tertiary treatment with ozone.

23056 APTIC NO. 43341

HOW THEY RE CONTROLLING SULFUR OXIDE EMISSIONS FROM ELECTRIC POWER GENERATING PLANTS. *J. Air Pollution Control Assoc., 22(6):474, June 1972.*

The EPA standards for sulfur dioxide for large new power plants are 0.80 and 1.2 lbs of SO2 emitted per million Btu of heat input for liquid and solid fossil fuel, respectively. Roughly applied, the standard means that about 75% of the sulfur must be removed from either the fuel or the combustion gases in a power plant burning 3% sulfur fuel. Twenty power plants either have a full-scale sulfur dioxide removal system or have contracted to put one on stream within the next several years. The total of these contracts is estimated to be $200 million, $140 million of which has been or will be spent for retrofit equipment on existing power plants. Although most of the contracts are for sulfur dioxide removal systems that employ limestone or lime, other types of systems are also being installed. In addition to the calcium-based scrubbing systems, three other SO2 abatement systems are being installed on four different power plants. Two of the processes employ scrubbing, one with a sodium-based system and the other with a magnesium oxide reactant. The third employs catalytic oxidation. Most of the control systems being installed are designed for 70 to 90% sulfur dioxide removal, and most of them accomplish high efficiency particulate removal as well.

23057 APTIC NO. 43357

FIGHT AGAINST AIR AND WATER POLLUTION. *Rubber Age (New York), 104 (7):51-52, July 1972.*

To control air pollution, the Orange plant of the Firestone Petrochemical Plant in Texas has no open burning of solid wastes. Instead, the solid wastes are hauled away to an approved sanitary land-fill. In all chemical plants of the butadiene type at Orange, a flare header and stack are provided to burn any gas which must be vented from the process equipment. Smokeless gas-fired heaters are also utilized at the Orange plant. The extensive antipollution activities at the Petrochemical Center are part of a two-year $8.8 million program being conducted on a corporate basis by the Firestone Tire and Rubber Company. A domestic sewage unit was installed when the synthetic rubber plant was constructed in 1961, and a separate sewer system was provided which could handle all water drains that might possibly contain oil. In addition to the American Petroleum Institute Separator, there is a terminal oil trap through which all the waste water flows before it leaves the plant. Other measures are taken to control the pH or alkalinity of the effluent.

23058 APTIC NO. 43369

LA CRACKER MODIFIED TO CUT EMISSIONS. *Oil Gas J., 70(30):49-50, July 24, 1972.*

The fluid-catalytic cracking unit built at Union Oil s Los Angeles refinery in the early 1950 s has undergone a number of revisions to add particulate emission control equipment. In 1952, the unit went on stream at a 28,500 b/d feed rate with two stages of cyclones in the regenerator and an electrostatic precipitator in the flue gas line to keep particulate emissions below 40 lb/hr. The arrangement used a waste heat steam generator to cool the regenerator flue gas to about 550 F upstream of the precipitator. In 1956, a small heater was added to the vent pipe to reheat the gas enough to eliminate formation of a detached plume, which occurred under certain atmospheric conditions. A carbon monoxide boiler was installed in 1961 to oxidize the CO in regenerator flue gas. The flue gas vent and heater were removed and the flue gas was discharged from the CO boiler stack. In the early 1960 s, the regenerator cyclones were replaced with ones designed to withstand higher temperatures. In conjunction with conversion to a vertical riser line, use of zeolitic catalyst and reblading of the regenerator air blower, the dust recovery equipment was augmented in 1967. The original pressurized precipitator was removed and third-stage cyclones were installed in a vacant vessel. A new precipitator was installed at ground level upstream of the CO boiler. Modifications in 1971 included another precipitator and a thermal oxidizer.

23059 APTIC NO. 43383

National Industrial Pollution Control Council, Washington, D. C., Electric and Nuclear Sub-Council

THE DISPOSAL OF MAJOR APPLIANCES. *22p., June 1971.*

GPO

Individual and national problems of major household appliance disposal, including that of air conditioners, dehumidifiers, disposers, ranges, freezers, refrigerators, dishwashers, washers, dryers, and water heaters are reviewed. Forecasts for the volume of discards by appliance are made, and the quantity of appliance waste to the total volume of solid waste is compared. Shredding may make the recycling of household appliances economically feasible. The problem of getting appliances to shredder operators can be handled by municipal collection agencies.

23060 APTIC NO. 43405

National Industrial Pollution Control Council, Washington, D. C., Electric and Nuclear Sub-Council

THE USE AND DISPOSAL OF ELECTRICAL INSULATING LIQUIDS. *22p., June 1971. 14 refs.*

GPO

Electrical insulating liquids, their application in such apparatus as transformers, circuit breakers, capacitors, and high-voltage cables, and their disposal are discussed. Ninety % of the insulating liquids are petroleum based, naphthenic mineral oils comprising over 80% by volume of the total usage, and polybutenes comprising almost 10% of total usage. These are relatively non toxic and biodegradable, representing no environmental threat when subjected to conventional secondary waste treatment. The third largest-volume insulating liquid is the askarels, or polychlorobiphenyls. This group has toxic properties. Guidelines for the disposal of askarels are recommended. Data are given on the quantities and uses of petroleum products, automotive and industrial estimated usage of lubricating oils, and the disposal of collected waste oil.

23061 APTIC NO. 43443

IMPROVED BAG FILTERS FOR DUST REMOVAL FROM GASES. *(Perfectionnements apportes aux filtres a manches pour le depoussierage des gaz). Text in French. (Heinrich Luehr VDI Staubtechnik (West Germany)) French Pat. 2,052,307. 9p., March 29, 1971. (Appl. March 27, 1970, 12 claims).*

An improved automatic bag filter, comprising parallel filter bags in an inlet chamber and spiral springs held by protruding frame, introduced in each bag for separating the filtering surfaces, is described. The springs are inserted through a port in a cleaned gas collecting chamber and across an appropriate gap in a wall separating the two chambers. Each bag is held tightly by its opening edge against the above wall, to which continuous Z-shaped profiles are attached between the gaps. The profiles terminate in one plane coinciding with the extremities of the frames inserted in the chamber, where a nozzle for cleaning the bag is inserted to move in both directions. The filter chamber contains several tie rods connected to the bottom of the filter bags, and tensioned by compression springs outside the wall. Filter chambers of considerable height may comprise several lines of superposed vertical and parallel filter bags.

23062 APTIC NO. 43484

RESTRICTION OF EMISSION. SULFUR DIOXIDE AND SULFUR TRIOXIDE FROM SULFURIC ACID INSTALLATIONS. *(Auswurfbegrenzung Schwefeldioxid und Schwefeltrioxid aus Schwefelsaeureanlagen). VDI (Verein Deutscher Ingenieure) Kommission Reinhaltung der Luft (West Germany), VDI Standard 2298, 8p., Aug. 1970. 15 refs. Translated from German. 20p.*

Processes leading to the formation of stripped gases containing sulfur dioxide and sulfur trioxide include preparation of gases containing SO2, and preparation of SO3 and sulfuric acid. Waste gases which develop in the production of 100% SO2 and contain SO2 are purified by alkaline washing. These gases are primarily associated with the production of contact sulfuric acid, which may absorb SO2-containing gases. Incorporation of intermediary absorption in the contact method reduces SO2 in waste gases from SO2 and sulfuric acid production by 60-80%. In the case of plants operating at a contact conversion below 97%, a comparable reduction in SO2 is achieved by washing waste gases with an alkaline solution. Installations such as candle filters, electric precipitators, or pressure drop precipitators are suitable for purifying sulfuric acid aerosols produced in the preparation of sulfuric acid from bituminous sulfur or by roasting flotation concentrates. They can also be used during wet catalysis or the preliminary concentration of residual acids.

23063 APTIC NO. 43514

CLEAN AIR PROTECTION BY UTILIZING SCRUBBERS IN FOUNDRIES. *(Reine Luft durch Gaswaescher fuer Giessereien). Text in German. Maschinenmarkt, 75(23):439, 1969.*

Scrubbers used in a foundry comprising five cupola furnaces are described. The emissions, containing ash, metals, carbon monoxide, and other gases, had to be reduced to at least 0.12 g/N cu m. One of scrubbers, serving a cupola furnace, decreased the total emission from 300 kg/hr to below 8.2 kg/hr. After the CO was oxidized by means of burners in the cupola, the waste gases underwent double-stage scrubbing for separating course particles. The gases were finally cooled to 50 C in a ring type cooling tower. A tandem system of scrubbers was applied to the rest of the four cupolas, with one scrubber serving two units each. The CO was oxidized by six burners in the furnace at a temperature of 980 C, after which the gas was conveyed, at a rate of 255,000 cu m/hr, to the bottom of a scrubbing tower of 14.7 m height and 2.7 m diameter. The water consumption lay at 1514 l/min, and the centrifugal water spray reached a speed up to 1800 m/min.

23064 APTIC NO. 43550

Factory Mutual System, Norwood, Mass.

ELECTROSTATIC PRECIPITATORS. *In: Loss Prevention Data. Hazardous Materials and Processes 7-2. 2p., 1971.*

Electrostatic precipitators impart an electrical charge to particles in a gas or air stream, causing them to adhere to oppositely charged collector plates. In single stage precipitators the particles are charged and collected between the same set of electrodes, while in double stage units the particles are charged in one section and collected in another. Construction, operation, and uses of both types of precipitator are described. Automatic sprinkler protection should be provided inside electrostatic precipitators having oil bath reservoirs or those collecting combustible materials. Other safety recommendations are made. Precipitators should be inspected and cleaned frequently, and the electrical equipment should be maintained in good condition.

23065 APTIC NO. 43562

COAL PREPARATION AND UNIT-TRAIN LOADING. *Coal Age, 1969:213-231, July 1969.*

Steps in the coal preparation process are described including: raw-coal storage and blending, primary breaking, rough cleaning, raw-coal sizing, washing, air cleaning, clean-coal sizing, dewatering and drying, crushing, dustproofing, salvage, retreatment, and loading. Information, including particle size and shape, dust load, operating temperature and efficiency, and space requirements, is provided for 11 types of dust-collection equipment. The principle materials used for dust-proofing of coal are oil, calcium chloride, and special chemical compounds.

23066 APTIC NO. 43575

California Air Resources Board, Technical Advisory Committee

RATIONAL PROGRAM FOR CONTROL OF LEAD IN MOTOR GASOLINE. *17p., March 12, 1970.*

The removal of lead additives from gasoline in an ordered and considered manner could hasten the attainment of minimum exhaust emissions from present and future motor vehicles. It is proposed that starting in 1971 one grade of gasoline be offered whose lead content is no greater than 0.5 g/gal and research octane number no less than 90. In addition, starting in 1971, the lead content in no gasoline shall be more than 2.0 grams per gallon. In 1974 one grade of gasoline will be lead-free and in January 1977 no lead whatsoever should be used in any grade. The basis for these determinations involves many factors. Principal among them is a limitation which the presence of lead in gasoline places on development of low-emission vehicles. Secondly is the effect which lead has in increasing emissions from presently existing vehicles. Another consideration is the consumption of natural resources involved in producing high octane number fuels and in burning lead as a fuel additive. Encouragement to lower vehicular emissions should be provided by incentives for automobile companies, oil companies, and the motoring public to strive for operation on fuels with reasonable octane number and with progressive elimination of lead as an additive.

23067 APTIC NO. 43298

Agarwal, J. C. and J. R. Sinek

APPLICATION OF PROCESS ENGINEERING TO ENVIRONMENTAL CONTROL IN METALLURGICAL PLANTS. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers (AIME), New York, N. Y., 13p., 1971. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 100th, New York, Feb. 26-March 4, 1971.)*

The objectives of process engineering are: to analyze the options that are technically feasible for the solution of a given pollution problem; to rank these options in the order of preference, according to economic criteria; and to present those options to management, with the cost information peculiar to each option. The approaches to environmental control are twofold, to take the process as is and clean the effluents, or to design the system to eliminate pollutants. The most profitable method is to institite changes at the plant design stage. Case histories of process engineering improvements are presented as examples to stimulate creative approaches. Particulate loading in blast furnace top gas has been controlled by pelletizing the ore charge and installing venturi scrubbing. This allowed temperature increases to nearly 2000 F, cut coke fueling in half, and cleaned top gas to less than 0.02 gr/scf. Five methods and their relative merits are discussed for top gas cleaning. The elimination of acid plumes has been accomplished by the Japanese copper smelting industry by rigidly air admission and gas temperature. Environmental control can only be dealt with by forming a cadre of process engineers versed in process and cost engineering.

23068 APTIC NO. 42889

Akhtar, Sayeed, Sam Friedman, and Paul M. Yavorsky

LOW-SULFUR LIQUID FUELS FROM COAL. *Preprint, American Chemical Society, Washington, D. C., 13p., 1972. 10 refs. (Presented at the American Chemical Society, National Meeting, 163rd, Boston, Mass., April 9-14, 1972.)*

Yields and chemical and physical properties were obtained for experimental desulfurized fuel oils made from three different coals slurried in coal tar to demonstrate that liquid fuels containing 0.3% sulfur may be prepareed from coals containing 3.0 to 3.4% sulfur via catalytic hydrodesulfurization in a continuous fixed-bed operation at 450 C and 2000 psi followed by centrifuging the products. Operations with coal tar involved three-pass hydrodesulfurization, but the use of recycle oil, rather than coal tar, as the liquid vehicle reduced hydrogen consumption and gave a fuel of 0.48% sulfur content after one-pass hydrodesulfurization The synthetic fuels are liquid at or near ambient temperature, contain no components boiling below 200 C, and are suited for direct use in oil-fired burners.

23069 APTIC NO. 42628

Aladzhalov, I. A. and V. A. Orlov

INCREASE IN THE CONCENTRATION OF SULFUR DIOXIDE IN CONVERTER GASES. *(Sposob povysheniya kontsentratsii sernistogo angidrida v konverternykh gazakh). Text in Russian. Tsvetn. Metal., 45(2): 14-17, 1972. 3 refs.*

The design and characteristics of a water- and air-cooled gas intake apparatus, installed inside a copper converter dust separator, are described. The gases, containing sulfur dioxide in high concentration, are sucked off selectively into a system leading to the sulfuric acid plant, while gases with a low SO_2 content are sent into a separate system. The dilution of the converter gases due to air drawn in is minimal. Efficiency for SO_2 separation and other parameters are calculated. The apparatus collected 80-90% of the converter gas when the gas concentration was a maximum 40-50% of that measured in the converter throat. A further increase of the efficiency is not advisable due to the rapid decrease in the concentration. The use of this apparatus permitted increased H_2SO_4 production without considerable additional expenditure.

23070 APTIC NO. 43545

Alei, Mohammed, Jr.

RAPID, CONTINUOUS CONVERSION OF NO TO N_2 PLUS H_2O. *Los Alamos Scientific Lab., N. Mex., Atomic Energy Commision Contract W-7405- Eng. 36, Rept. LA-4904, UC-4, 5p., April 1972. 5 refs.*

NTIS: LA-4904

The reaction between nitric oxide and molecular hydrogen to yield water plus molecular nitrogen proceeds rapidly and quantitatively on a nickel or platinum surface at elevated temperatures. A system is described for carrying out this reaction over a supported nickel catalyst in an atmospheric pressure flow system. The possibility of recovering nitrogen as calcium nitride in the same system is demonstrated. Conditions for producing ammonia and water rather than nitrogen and water as primary reaction products are also indicated. The apparatus and procedure are described, as well as catalyst preparation and experimental results. Catalyst temperatures and other process parameters are indicated. (Author abstract modified)

23071 APTIC NO. 43671

Almborg, V.

VENTILATION AND DUST COLLECTORS IN MELTING DEPARTMENTS. *Ventilation och stoftavskiljning i smaltavdelningar). Text in Swedish. Gjuteriet, 46(6-7):86-91, June-July 1956. (Presented at the Ventilation in Foundries Conference, Jonkoping, Sweden, April 16-17.)*

Different methods for the removal of dust and smoke generated by different types of melting furnaces are described. Screening hoods with fresh-air inlet above the furnace, dilution with a fresh-air inlet through the floor, and local exhaust by means of adjustable hoods are applied to crucible furnaces. Electric furnaces can be equipped with adjustable sectional hoods for effective ventilation. Different ventilation techniques for cupola furnaces and batch handling (e.g., ventilation through adjustable sectional hoods, bottom openings, use of stack ejectors, and pressurized hoods for lining repair) are described. Dust collectors for cupola furnaces include bag filters, electrostatic filters, and scrubbers. Ultrasonic dust separation techniques are under study. Pretreatment and cooling of the waste gas followed by dust separation in bag filters with automatic continuous dust removal is applied in a foundry in the U. S. A.

23072 APTIC NO. 43650

Anderson, Thomas H.

MEETING THE CHALLENGE OF AIR POLLUTION CONTROL IN OUR PLANT. *Grain and Feed Dealers National Assoc., Washington, D. C., Proc. Natl. Sym. Air Pollution, Washington, D. C., 1967, p. 75-79. (Jan. 11-12.)*

Dust control methods in receiving, handling, and storage of feed and grain plants are discussed. Dust sources in these plants are grain dryers, conveying and elevating systems with inefficient control equipment, the cleaning operation, and interchange points. A new 100% dust-free system is described. The basis of this system is a completely enclosed high-capacity belt conveyor; at no point in the system is the grain exposed to the atmosphere. The basement of the elevator which houses all the conveyors under the storage bins and truck dumps is kept under a slight positive air pressure. Air used to pressurize the basement is drawn through a regular air-conditioning filter and then through a secondary paper media filter. The operation of, advantages, and cost of the system are reviewed. Designs for future dust-free plants are considered.

23073 *APTIC NO. 42863*

Aoki, Teruo

DUST COLLECTION DEVICE. (Shujin sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-156. 2p., Jan. 6, 1972. (Appl. Sept. 12, 1969, 1 claim).

This invention relates to a dust collector for the purification of flue gas from a duct or stack which contains particulates and soot. Multiple layers of metal nets are obliquely placed in the dust collector at certain points, with nets having smaller meshes installed in the lower part. On top of each metal net is a spray nozzle, a space is left between the collector wall and the lower side of the net. Dust-containing flue gas is introduced from the top of the collector and washed by water sprayed from the nozzles before passing the nets. Particles larger than the net mesh are washed by water through the spaces between the walls and the nets. Small particles are also caught by water films formed on meshes and removed. Below the last net, cylinders with fine holes are placed through a horizontal plate with the open ends face up. The films of water that form on the fine holes double the effectiveness of dust removal.

23074 APTIC NO. 42649

Araki, Saburo and Yasuo Tatsutomi

FUEL EVAPORATION EMISSION CONTROL METHOD. *(Nenryo no kikabutsu haishutsu boshi sochi). Text in Japanese. (Toyo Industries, Co., Ltd. (Japan)) Japan. Pat. Sho 47-16207. 2p., May 13, 1972. (Appl. April 30, 1969, 1 claim).*

This is a device for prevention of fuel evaporation emission into the atmosphere. An adsorbent, such as activated carbon, is installed in the suction passage of the carburetor so that the suction resistance will be minimized. When the engine is stopped and the key is switched to the off position, a valve, installed in front of the adsorbent, closes automatically and prevents emission of fuel evaporation into the air. The valve is opened by an electromagnet and as it is turned off, it is closed completely by a spring.

23075 APTIC NO. 42995

Arend, A. G.

RESEARCHES IN DISPELLING OFFENSIVE ODOURS. *Perfum. Essent. Oil Rec., vol. 49:118-119, March 1958.*

Methods of tackling the problem of offensive odors falls into different categories, since no one system is satisfactory for all applications. The simplest arrangement comprises passing the odor-laden air through various oxidizing agents in place of the normal air conditioning system. Hypochlorous acid and potassium permanganate are typical oxidizing agents. Deodorization by what is described as antisepsis is based on the assumption that the objectionable odor is generated by microorganisms, and which if destroyed by suitable agents, will render the atmosphere free. Vapors of gases which cause undesirable odors can frequently be caused to collect at the surface of porous materials, under the category of adsorption. Perfumed deodorants, catalysis, and electrostatic precipitators are also indicated for odor counteraction.

23076 APTIC NO. 43130

Auer, Werner

THE PRODUCTION OF SYNTHESIS GASES BY PARTIAL OXIDATION AT HIGH PRESSURE. *(Herstellung von Synthesegasen durch partielle Oxydation unter hohem Druck). Erdoel Kohle (Hamburg), 24(3): 145-149, March 1971. Translated from German. Leo Kanner Assoc., Redwood City, Calif., 14p., Dec. 1971. (Presented at the German Society for Mineral Oil Science and Coal Chemistry, Annual Meeting, 21st, Stuttgart, West Germany, Oct. 7, 1969.)*

The operation of a commercial scale plant using synthesis gas for ammonia production is reviewed. The individual process steps include gasification of heavy fuel oil with oxygen in a Texaco generator at a pressure of 82 atm, with separation of the soot and recycling to the generator; carbon monoxide conversion; carbon dioxide and hydrogen sulfide removal; liquid nitrogen wash for the removal of CO, methane, and argon; and compression and NH3 synthesis. The advantages of high pressure for the processes and experiences with soot removal, corrosion, and burner development are reviewed. In the production of synthesis gas for the oxo or methanol synthesis, i.e., the production of alcohols from propylene and CO-hydrogen mixtures, the gas must have a CO:H2 ratio of 0.81:0.83. The process route consists of gasification and CO2 or sulfur wash. The gasification can be carried out industrially in the same way as for NH3 production. The production of hydrogen for hydrogenation consists of gasification with quenching; conversion in three steps; CO2/H2S wash; and methanization.

23077 APTIC NO. 43614

Aureille, R. and P. Blanchot

EXPERIMENTAL INVESTIGATION ON THE EFFECT OF DIFFERENT PARAMETERS ON THE SEPARATION EFFICIENCY OF AN ELECTROSTATIC PRECIPITATOR. *Staub Reinhaltung Luft (English translation), 31(9):23-28, Sept. 1971. 3 refs.*

NTIS: TT 71-50113/09

A semi-industrial pilot plant was built in which a homogenous mixture of cold air and fly ash from a power station was used as the waste gas. Upstream and downstream of the precipitator two measurement stretches are arranged, enabling: the local gas velocities to be measured and the entire waste-gas throughput to be determined; and specific samples to be taken, on the basis of which the spatial distribution of the dust concentration is determined. Apart from the already known effects of gas velocity, velocity profile of the gases at the precipitator inlet, the relative waste gas humidity, and the voltage polarity, the drift velocity can also be changed by: altering the distance between discharge and collecting electrodes, selecting a suitable type of discharge electrode, and producing a concentration distribution at the precipitator inlet, which is nonuniform, having a maximum at the lower part of the precipitator. This inhomogeneous concentration distribution is obtained independently of the waste gas velocity distribution which should be as uniform as possible.

23078 APTIC NO. 43544

Backstrom, Bjorn Olav

AIR CONSERVATION PROBLEMS IN THE FINNISH FORESTRY INDUSTRY. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 2:53-2:64. (Sept. 1-6.)*

Air conservation problems in the Finnish forestry industry are reviewed. Laws regulating the emission of sulfur dioxide, hydrogen sulfide, and particulates are discussed. The forest industry s localization and production is described. Control methods considered by the sulfite and sulfate pulp industry include the use of boilers with flue gas purification, electrostatic precipitators, scrubbers, cyclones, and evaporators.

23079 APTIC NO. 42301

Bailey, Ferrall W.

GAS SAVING AND ANTI-POLLUTION DEVICE. *(Assignee not given.) U. S. Pat. 3,656,462. 4p., April 18, 1972. 15 refs. (Appl. Oct. 7, 1970, 3 claims).*

A gas mileage booster and pollution control device for internal combustion engines are described. This multi-purpose device increases the horsepower of the engine, saves on the wear of the spark plugs, cools the oil in the motor, cuts the amount of carbon in the carburetor, involves no working parts to worry about with respect to wear or breakage, and is not adversely affected by the air conditioning unit in the vehicle or aircraft. The device comprises a hot air passageway from the exhaust manifold, an adjustable cold air passageway from the vehicle interior, a T connection for mixing the cold and hot air of both passageways, and a passageway connected to the air cleaner of a carburetor for bringing in the air mixture. (Author abstract modified) 0

23080 APTIC NO. 42739

Balgord, W. D., R. W. Strickland, and K. W. Wang

NOVEL CATALYSTS AND CATALYST SUPPORTS FOR THE CONVERSION OF NITRIC OXIDE. *New York State Dept. of Environmental Conservation, Albany, Environmental Quality Research and Development Unit, TP-18, 30p., May 1971. 12 refs.*

Highly active catalysts for the reduction of nitric oxide with carbon monoxide were prepared and evaluated. It was possible to demonstrate NO conversions of 99% at 25 C under nearly dry conditions in feed mixtures containing 1500-1700 ppm NO and 1.5 to 2.0% CO at bed space velocity of 15,000/hr. Under moist conditions conversions of 98% were attained at 100 C. These results compare favorably with observed NO conversion over several commercial copper chromite catalysts: 99% removal at 300 C under comparable feed condition. Results indicate that efficient catalysts can be prepared from compositions based on CoCr, CuCr, Fe, Ni, and LaCoO3, provided catalysts are properly matched with support. The most promising supports are a porous silica glass pretreated with NH4HF2, a class of controlled pore silicas, metal felt, and metal foam. Catalyst-support combinations thus far studied are not considered to be fully optimized with regard to long-term stability in exhaust environments. Studies in progress are expected to demonstrate the potential for actual application to automotive emissions control. A limited number of ageing tests of short to moderate duration indicated good stability for certain catalyst support combinations in pulsed flame combustor exhaust and in air at 800 C up to 100 hr. Exposure to exhaust of a pulsed flame combustor was actually observed to enhance the activity of several catalysts. To avoid induced pollution from catalyst attrition products, careful selection of catalyst composition, mode of preparation, and support or use of nontoxic catalysts such as those based on iron are recommended. (Author summary modified)

23081 APTIC NO. 43186

Bangel, E. R.

AIR POLLUTION CONTROL FOR CUPOLA EMISSIONS. *Preprint, American Industrial Hygiene Assoc., Detroit, Mich., 8p. 1970. (Presented at the American Industrial Hygiene Assoc. Meeting, Detroit, Mich., May 15, 1970.)*

The hot-blast water-wall cupola used in modern foundry practice generates 20,000-30,000 lbs of dirt/16-hour day. In a complete wet emission control system, a quencher immediately after the bustle take off reduces gas temperature and knocks out some of the larger dust particles. This is followed by a venturi scrubber and a separator tower. The final pieces along the line of gas flow are an exhaust fan and the stack. All the water used is carried to other areas of the plant site for processing to remove the solids collected. Important considerations relative to this system are: a settling pond or water reclaim tanks large enough to ensure clean recirculating water, adequate stack height and high discharge velocities, and controls that will not permit restart until the entire system is ready. In the dry control method, the first major piece of equipment is a combustion chamber for incineration of hazardous gases. The off gases then pass through a heat exchanger to reduce the temperature to a point that will be acceptable for entry into a bag house collector. A cyclone dust collection is inserted between the heat exchanger and the bag house. The dry dust is handled either in closed or well-covered containers or made into slurry. Cupola temperatures and corrosive properties of gases determine the materials used for the emission control system.

23082 APTIC NO. 43411

Barnebey, H. L.

AIR POLLUTION CONTROL BY ACTIVATED CARBON. *Preprint, Air Pollution Control Association, Pittsburgh, Pa., 18p., 1956. (Presented at the Air Pollution Control Association, Annual Meeting, 49th, Buffalo, N. Y., May 20-24, 1956.)*

The application of activated carbon to air pollution problems is discussed. Adsorber construction, the types of activated carbon utilized, systems in which activated carbon performs two or more functions, elimination by catalysis, and the final disposal of adsorbed material are reviewed. Other purification methods used in conjunction with activated carbon adsorption include mechanical filtration, centrifugal separation, gravity separation, impact contactors, electrostatic precipitation, thermal combustion, catalytic combustion, ion exchange, reaction with solids, scrubbing with liquids, adsorption, compression and condensation, dilution and dispersion, masking agents, and recirculation. Activated carbon s position in the ventilating system and in the equipment or building structure are considered. Typical purification systems, the advantages of activated carbon use, its performance and cost are considered.

23083 APTIC NO. 42370

Bartok, W., A. R. Crawford, A. R. Cunningham, H. J. Hall, E. H. Manny, and A. Skopp

STATIONARY SOURCES AND CONTROL OF NITROGEN OXIDE EMISSIONS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 801-818. 46 refs. (Dec. 6-18, Paper EN 28D.)*

To characterize the nature and magnitude of the stationary nitrogen oxide (NOx) emission problem in the U. S., Esso Research and Engineering Company conducted a study of nitrogen oxide control methods for stationary sources. This study included only man-made sources. Nitrogen oxide emission inventories were compiled for all significant sources from 1950 to date, with projections and forecasts made to the year 2000, taking into account technological, economical, and sociopolitical changes. The stationary NOx emission inventories and projections were compared with estimates of potential NOx emissions from mobile sources, on an uncontrolled basis. Existing and potential stationary NOx emission control technologies were assessed in three broad categories: combustion modification techniques; inprocess removal methods of NOx from flue and tail gases; and other industrial process modifications. Costs for the control methods are discussed.

23084 APTIC NO. 43157

Beavon, David K. and Frank W. King

NEW PROCESS CUTS AIR POLLUTION FROM SULFUR PLANTS. *Oil Gas Intern., 11(3):68-69,71, March 1971. (Presented at the Canadian Natural Gas Processing Association Meeting, Banff, Alberta, Sept. 1970.)*

When large reserves of sour crude oil and sour natural gas were discovered in several parts of the world during the mid-fifties, the importance of sulfur recovery became clear. Hydrodesulfurization processes replaced less efficient chemical treatment processes for sour crude, and natural gas treating processes became a common requirement for natural gas processors. In both cases, the modified Claus process was generally employed to recover elemental sulfur from the hydrogen sulfide removed or generated from the sour petroleum products. However, the Claus equilibrium barrier is a very serious obstacle if total sulfur recovery is the objective. The second basic handicap to sulfur plant efficiency lies in the relatively inert sulfur compounds, carbonyl sulfide and carbon disulfude, which are formed in the reaction furnace and are then slow to react to sulfur over the Claus catalyst. By hydrogenation under very moderate conditions of temperature and pressure, all of the sulfur present in the tail gas as SO_2, COS, CS_2, and elemental sulfur liquid or vapor can be converted back to pure hydrogen sulfide. A cobalt molybdenum catalyst was used to speed the reaction in a demonstration unit. The Ralph M. Parsons Co. is now prepared to build commercial plants which combine hydrogenation, cooling, and the Stretford process for the removal of H_2S from hydrogenated tailgas; this combination has been named the Beavon Sulfur Removal Process, Mark I. The Stretford process uses a sodium carbonate solution which reacts with H_2S to form sodium hydrosulfide. The hydrosulfide is oxidized to sulfur by sodium vanadate also in solution. Subsequently the vanadium is oxidized back to the pentavalent state by blowing with air, with sodium anthraquinone disulfonate working as an oxidation catalyst. The finely divided sulfur appears as a froth which is skimmed off, washed, dried, and added to the product from the parent sulfur plant.

23085 APTIC NO. 42747

Belokon, S. M., N. V. Lebed ko, and Yu. A. Petrov

THE PLANNING OF EQUIPMENT FOR PRELIMINARY DUST REMOVAL FROM SINTERING MACHINE GASES. *Metallurgist (USSR) (English translation from Russian of Metallurg.), no. 1-2:16-19, Jan.-Feb. 1970.*

One method for increasing the overall effectiveness of gas cleaning systems is to improve the operation of equipment for preliminary dust removal from sintering machine gases. The dynamics of removing dust along the length of the sintering grate of various types of sintering machines has been studied. Several examples of the dust removal efficiency of different methods and types of equipment are given. A proposed gas-outlet method for sintering machines, with and without cooling of the sinter on the grate, is shown. This method provides a rational use of the collector as a settling chamber, since the maximum rate of gas flow is in those portions of the collector where the smallest amount of dust is received.

23086 APTIC NO. 43563

Benzon, William

COAL PREPARATION INNOVATIONS AT PIKE 26 MINE. *Mining Congr. J., 54(8):34-38, Aug. 1968.*

Selection of cleaning facilities for the plant was based on the need to produce metallurgical coal of good, uniform quality with maximum recovery. Two heavy medium circuits were used. For the coarse coal, Tromp shallow vessels were selected, while cyclones were provided for cleaning the fine sizes down to 28 mesh. The size split between the units can be made at 1 in. or three-eighths in. depending on the size consist of the plant feed. The washing procedures, including filtration of the wash water, are described. Performance tests were conducted on the bath and cyclone. A proposed fine coal circuit with increased capacity has been designed.

23087 APTIC NO. 43681

Berby, R. H.

DUST COLLECTOR APPLICATIONS EXPERIENCE. PART V. *IEEE (Inst. Elec. Electron. Engrs.) Trans. Ind. Appl., 8(1):17, Jan.-Feb. 1972.*

Results of operating experience with dust collector installations, especially fabric collectors on wet-process kilns, are presented. Successful fabric collectors were found utilizing both positive and negative pressure systems. Most successful negative-pressure installations were well insulated and utilized hot exhaust air for cleaning. It appeared to be a wise design practice to allow for later addition of further bag sections. Heavier weaves (12+ oz/sq yd and the combination of siliconized and graphited fabric treatment gave longer life. Manifolding a multiplicity of smaller (15,000 cu ft/min range) prefabricated collecting units together offered a number of advantages. Cost savings approximated 30%; time savings averaged 2 months out of 12; and ease of maintenance was obtained. One installation utilizing clean-up precipitators following cooler multicyclones reported successful operations without the need for conditioning water sprays. Dusting scoops have been a problem in some installations, and notably absent in two cases wherein the scoops are located just up the feedstream of the point of the enlarged diameter of belled kilns. Regulated dust return appeared generally desirable for elimination of surges in kilns with fabric collectors and their longer intermittent cleaning cycles, but seemed of uncertain value in precipitator systems having good and more frequent cleaning cycles. In either system, however, any kiln-dust-holding vessel required aeration and vibration. Dust-hopper sides should slope at least 60 deg and a 9- inch minimum diameter collecting screw is desirable. (Author conclusions)

23088 APTIC NO. 43687

Bernstein, Ralph H., John R. Ehrenfeld, and Thomas R. Parks

COST EFFECTIVENESS MEASUREMENTS OF EMISSION CONTROL EQUIPMENT FOR INTERMEDIATE-SIZE BOILERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1972. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-74.)*

An in-depth investigation of the pollution from intermediate-size boilers was carried out and consideration given to the possible methods of abating this pollution. This category of boilers includes all units used in commercial buildings, virtually all industrial units and a few of the smaller utility-size equipment. All fossil-fuels are included. All commercially feasible means of controlling emissions were explored with respect to their efficiency, capital cost requirements and operating costs; this includes fuel switching, flue gas cleaning or treatment, combustion additives, and combustion design techniques. Because these boilers are small, often unattended, located with limited space, operate at low annual capacity, fuel switching is the most effective control strategy, especially as it will substantially reduce particulates and sulfur oxides. For nitrogen oxides reduction, only the combustion techniques of low excess air and flue gas recirculation are effective and these are economically feasible only on the cast iron and firetube sizes. The sulfur dioxide removal schemes evaluated were the nahcolite dry process, the sodium carbonate dry process with fabric filter, sodium carbonate scrubbing, dry calcium carbonate, calcium carbonate scrubbing, and calcium oxide scrubbing in different sizes of oil and coal boilers. The four types of particulate control equipment considered were dry cyclones, wet scrubbers, electrostatic precipitators, and fabric filters.

23089 APTIC NO. 43583

Bethell, F. V., D. W. Gill, and B. B. Morgan

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSION OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED BED COMBUSTION OF COAL. APPENDIX 6. MATHEMATICAL MODEL OF SULPHUR RETENTION. (TASK VI). *National Coal Board, London (England), Fluidised Combustion Control Group, Office of Air Programs, APTD-1084, Rept. DHB 060971, 59p., Sept. 1971. 10 refs.*

NTIS: PB 210675

A mathematical model was developed for the sulfur absorption process in fluidized bed combustion of coal to assist in understanding the performance of the experimental plant and to help in extrapolating the experimental results to other plants and feed materials. The terminal velocities of particles in up to ten size groups, and the bed composition with regard to the weight of ash and limestone particles in the selected groups, were calculated from the input data. The procedure also determined the mean residence time of each group of particles. The absorption of sulfur dioxide in and above the bed was then calculated, using mean SO2 concentration calculated for an assumed mean reactivity for the bed. The model used semi-empirical constants to compute the rate of reduction of particle size in the bed due to attrition and the residence time of fines in the bed; constants were applied to express the mode of evoluation of SO2 in the bed. A computational procedure was introduced to allow for the exposure of fresh unsulfated lime by abrasion of the sulfated layer to compensate for regeneration by attrition. Model predictions and actual plant performance were in good agreement where the acceptor did not contain a large fraction of material fine enough to be elutriated. The general shape of the curves of retention versus calcium/sulfur mol ratio from plant experiments were more consistent with SO2 evolution occurring throughout the bed rather than solely at the bottom. (Author summary modified)

23090 APTIC NO. 43585

Bethell, F. V., A. A. Herod, G. McDonald, B. A. Napier, and D. H. T. Spencer

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSION OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED BED COMBUSTION OF COAL. APPENDIX 8. LIMESTONE AND DOLOMITE STUDIES. (TASK VIII). *National Coal Board, London (England), Fluidised Combustion Control Group, Office of Air Programs APTD-1084, Rept. DHB 060971, 214p., Sept. 1971. 26 refs.*

NTIS: PB 210675

The pore structure and related characteristics of limestone and dolomite were investigated to determine effects on sulfur retention in a fluidized bed combustion system for coal. The development of pore structure on calcination, both with and without sulfation, was studied, and rates of reaction with sulfur dioxide for use in a mathematical model were determined. Mercury injection porosimetry was used to determine the distribution of pore volume with respect to pore entrance diameter. The development of porosity on calcination was a time and temperature dependent process, and the amount of porosity was a linear function of carbon dioxide loss. On calcination, porosity was generated initially more rapidly in dolomite than in limestone. There was little porosity with pore entrance diameter in the range 0.014 micron 0.26 nm with the calcined-only material or, with one possible exception, with the calcined-sulfated materials. Sulfation varied with time and caused a reduction in porosity. Absorption rates for different additive types, the mechanism of sulfur fixation, impermeable layer formation on sulfation, and the effects of temperature and thermal cycling were also examined.

23091 APTIC NO. 42944

Bhatia, S. P.

SOME ASPECTS OF SELECTIVE ABSORPTION OF H2S IN THE PRESENCE OF CO2 IN ALKALINE SOLUTIONS. *27p., 1971. 6 refs. (Presented at the Canadian Chemical Engineering Conference, 21st, Montreal, Quebec, Oct. 12-15, 1971.)*

Recent literature on the selective absorption of hydrogen sulfide in the presence of carbon dioxide is reviewed. Data from two specific investigations are given. In the first case, Alkazid solution was tried as the alkaline reagent and it was confirmed that selective absorption of H2S could be achieved by limiting the residence time. In the second investigation, small quantities of activated carbon were added to a scrubbing solution containing sodium carbonate and sodium bicarbonate in order to catalyze the in situ conversion of HS ions to S2O3 and sulfate ions. In a buffer solution containing Na2 CO3 and NaHCO3 in the pH range 8.5 to 9.5 SH ions limit the further absorption of H2S due to the following reversible reaction: Na2CO3 plus H2S yields NaHCO3 plus sodium hydrosulfide. If the gas contains at least 1% oxygen, small quantities of activated carbon catalyze the conversion of HS ions to S2O3 and sulfate ions, thus forcing the above equilibrium entirely to the right, and enhancing the absorption capacity of the solution. This approach is especially useful in the treatment of certain waste gases containing high concentrations of carbon dioxide and low concentrations of H2S, provided that they contain some residual 02. (Author abstract)

23092 APTIC NO. 42330

Blackmore, D. R.

AUTOMOTIVE EMISSIONS--THE BACKGROUND ACTIVITY. *Petrol. Rev., 26 (305):169-174, May 1972.*

While it is relatively easy to identify pollutants in the exhaust gas from a motor car which are known to be toxic to human life at high concentrations, it is extremely difficult to identify any harmful effects as a consequence of human exposure to dosages prevalent under normal living and working conditions. The different levels that different countries have enacted for vehicle emissions are indicated for the present and for the next few years. These emissions include hydrocarbons, carbon monoxide, and nitrogen oxides. Legislation concerning lead in gasoline is also considered. Some possible solutions comprise alternative power units, internal combustion engine design modifications, alternative fuels, and the reduction of lead in gasoline. Air injection systems, catalytic oxidation, exhaust gas recirculation, and lead traps are mentioned, as well as the Wankel engine and the stratified charge engine.

23093 APTIC NO. 43682

Blakeslee, C. E. and H. E. Burbach

CONTROLLING NOX EMISSIONS FROM STEAM GENERATORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., 1972. 8 refs. (Presented at the Air Pollution Control Association Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-75.)*

Nitrogen oxide emission data obtained in the testing of tangentially fired utility boilers is reviewed. Oxygen and NOx measurements were taken at the gas inlet to the air preheaters using a probe grid with a minimum of twelve points. Oxygen was continuously monitored using a paramagnetic analyzer. Replicate samples were analyzed by the phenoldisulfonic acid method, and a continuous electro-chemical analyzer was used for trending NOx on certain series. Flyash samples were collected to determine the influence of combustion modifications on solid combustible emissions. Operating data were taken to establish fuel firing rate and air flow distribution. Observations were made of furnace conditions and stack appearance. Inspections to determine the condition of windbox compartment dampers and fuel nozzles were made when outages could be scheduled. Fuel type used included natural gas, residual oil, and coal. Observations were made on the following changes in operating or design variables: excess air, nozzle tilt, air flow distribution, load reduction, flue gas recirculation, overfire air simulation, fuel nitrogen, furnace slagging, low air preheat, and water injection. Areas under current investigation are listed.

23094 APTIC NO. 42862

Blakney, John H. and J. K. Kendrick

CLEANER AIR THROUGH FUEL AND LUBRICANT TECHNOLOGY. *Lubric. Eng., 28(7):248-253, July 1972. 8 refs.*

There are gasolines and lubricants available today that significantly contribute to reduced air pollution. This contribution is principally due to the inclusion of additives that control deposition in the induction and positive crankcase ventilation systems of a spark ignition engine. These additives help to maintain the low emissions of hydrocarbons and carbon monoxide designed into new cars, and to reduce the exhaust emissions of older vehicles with dirty induction and positive crankcase ventilation systems. Some effects of lubricating oil and gasoline on exhaust emissions are considered. (Author abstract modified)

23095 APTIC NO. 42442

Bosecker, R. E. and D. F. Webster

PRECOMBUSTION CHAMBER DIESEL ENGINE EMISSIONS - A PROGRESS REPORT. *Preprint, Society of Automotive Engineers, Inc., New York, 12p., 1971. 7 refs. (Presented at the Society of Automotive Engineers, National West Coast Meeting, Vancouver, British Columbia, Aug. 16-19, 1971, SAE Paper 710672.)*

Diesel precombustion chamber engines are among the lowest emission power sources available today. Due to excellent fuel-air mixing and complete combustion, hydrocarbon and carbon monoxide emissions are extremely low. Nitrogen dioxide levels are also relatively low because of the divided chamber quench effect. Because of the low HC and CO levels, research efforts have been concentrated on lowering NO2 levels. Retarded timing and inlet air cooling through the use of aftercoolers, water induction, and exhaust gas recirculation have all shown beneficial effects. Smoke levels are minimized by selective matching of engine and turbocharger to assure adequate air for combustion. (Author abstract modified)

23096 APTIC NO. 43652

Brancaccio, John and Charles V. Flach

USE OF DRY FUEL ADDITIVES TO REDUCE SO2 EMISSIONS FROM A FULL SIZE INDUSTRIAL COAL FIRED BOILER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1972. 1 ref. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-77.)*

Several dry additives were aspirated into two different zones of a 100 million BTU/hr input, spreader-stoker, coal-fired boiler to determine which were effective in reducing sulfur dioxide and nitrogen oxides emissions. Tests were run with both proprietary materials and commercially available chemical compounds. Acceptable SO2 reductions were obtained only with sodium bicarbonate and sodium carbonate. Reductions of NOx were not discernable with any of the additives. Sodium carbonate was injected into the combustion zone at stoichiometric ratios of that reduced SO2 emissions from 20% to 70%. Utilization efficiencies decreased from 76.5% to 45.5% as the amount of powder injected was increased. Sulfur dioxide emissions were measured by the Shell method and by a photometric analyzer. The percent reductions measured by the two methods correlated closely. Further investigation is needed to prevent sodium carbonate deposits inside the boiler and to improve the utilization efficiency. (Author abstract modified)

23097 APTIC NO. 43200

Brechtelsbauer, O. J.

CUPOLA GAS SCRUBBERS. *Am. Foundryman, 27:34-37, Feb. 1955.*

The performance of wet cupola gas scrubbers at various gray iron foundries is discussed. Guidelines are given for optimum scrubber performance. Cleaning and maintenance procedures and costs are reviewed. Effluent dust loading tests and analysis of particle size were conducted to check the performance of single spray nozzle units. Results of the tests in grains/cu ft at 500 F, which varied only 0.04 grains, indicate accuracy and reliability. The average of 12 samples was 0.11 grains/cu ft at 500 F, indicating that the scrubbers are reasonably effective. The analysis of particle size showed that only about 1% by weight of the escaping particulate matter exceeded 40 micron in diameter. Over 99% of the particles were less than 5 micron in diameter.

23098 APTIC NO. 42755

Breen, B. P., A. W. Bell, N. Bayard de Volo, F. A. Bagwell, and K. Rosenthal

COMBUSTION CONTROL FOR ELIMINATION OF NITRIC OXIDE EMISSIONS FROM FOSSIL-FUEL POWER PLANTS. *Combustion Inst., Pittsburgh, Pa., Symp. (Int.) Combust., (Proc.), 13th, Salt Lake City, Utah, 1970, p. 391-401. 6 refs. (Aug. 23-29.)*

The techniques currently available for the reduction of oxides of nitrogen in power plant utility boilers are described. Combustion techniques of delayed mixing, premixed off-stoichiometric flames, off-stoichiometric diffusion flames (secondary combustion), and direct temperature control were examined theoretically by the use of a chemical kinetics digital computer program. The governing chemical reactions are presented along with the kinetic rate constants utilized and the results of a theoretical analysis. Tests were conducted on several full-size utility boilers to evaluate some of the possible operational methods. Using off-stoichiometric combustion, obtained by shutting off selected burner fuel flows and maintaining air flow, nitric oxide concentrations were decreased from 470 ppm to approimimately 180 ppm. Direct temperature control tests were performed, by reducing combustion air preheat, at air preheats of 650 F and 580 F. A decrease in NO formation from 250 to 200 ppm was obtained. Another method of direct temperature control tested was combustion product (exhaust) gas recirculation. In this test, the NO concentration was reduced from 350 to 150 ppm for a recirculation ratio of approximately 20%. Combustion control often can be the most economical and practical method of reducing NO emissions. Current chemical kinetics technology allows quantitative estimates to be made of the NO reductions obtained by altered combustion. This permits more rapid improvement of existing plants, and provide an additional design for new boilers. (Author abstract modified)

23099 APTIC NO. 43417

Burke, E.

DUST ARRESTMENT IN THE CEMENT INDUSTRY. *Chem. Ind. (London), no. 42:1312-1319, Oct. 15, 1955. 7 refs. (Presented at the Symposium on the Prevention of Atmospheric and Water Pollution in the Chemical Industry, London, England, April 4-5, 1955.)*

The problems posed by dust emissions from cement factories along the Thames River area, and results of field tests of control equipment, are presented. All operations connected with cement handling require dust control. The dust emanating from cement factory chimney consists of flyash from coal combustion, calcium sulfate, clinker dust, and decarbonated chalk. Chains and dust chambers of modern rotary cement kilns remove all but the finer particles, so the problem is one of precipitating these very fine particles from a very large volume of gases containing a considerable proportion of water vapor. High-efficiency cyclones (a series of small-diameter cyclones connected in parallel) prevent accumulation of dust under the tip plate by a by-pass leading it down to the lower part of the cyclone. A plant consisting of 12 of these cyclones, (each of 4-ft diameter) and handling 75,000 cu ft/min at 450 F for 3 1/2-in. water gage was tested. Overall collecting efficiencies of 80% to 85% were obtained (ranging from 98.4% efficiency for +20-micron particle size to 49.3% for -5 particle size. Tests on rod and tube electrostatic precipitators indicated 97% efficiency for a gas volume of 79,750 cu ft/min at 474 F. Modifications were made to combat corrosion of reinforced-concrete precipitator casings. The flues are now in the center of the casing, which allows one half of the precipitator to be kept in service while the other half can be repaired; a thicker concrete cover has been allowed on the underside of the reinforcing bars; the tube-chamber roof has T-beams, the space between beams being filled with lightweight insulating material; and all walls are lined with 4 1/2 in. brickwork with 1-in. air gap. In addition, dust hoppers were replaced by a rectangular dust chamber with scraper conveyors running at low speed and removing the dust and hamer-type rapping gears were replaced by vibrators. Costs of operating precipitators in the Thamesside area are reviewed.

23100 APTIC NO. 43474

Burrill, Scott L.

CONTROLLED ENVIRONMENT THROUGH PLANT DESIGN AT ASARCO S MISSION CRUSHING PLANT. *Preprint, Society of Mining Engineers, AIME, N. Y., 16p., 1971. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, New York, Feb. 26 - March 4, 1971, Paper 71-B-65.)*

The ASARCO Mission crushing plant consists of primary crushing, secondary and tertiary crushing, grinding, flotation, filtering, tailing disposal, and molybdenum by-products sections. Products produced are 28% copper concentrate shipped to a company smelter and molybdenite concentrate (52% molybdenum) shipped to steel company buyers. Dust collection equipment used at the primary crusher consists of an American Air Filter Rotoclone, with air pickups located in the grizzly undersize bin, the 6 ft pan feeders, and over the acceleration conveyor transfer chutes. Air pickups in the intermediate stockpile area are located over each of the 54 in. Syntron vibrating feeders. There are three Rotoclones in the secondary crushing plant, with ducting carried to almost all pieces of operating equipment. Six American Air Filter Wheelabrators are mounted over the fine ore bins with pickup at the discharge of the 48 in. feed conveyor and the bin open area. The collectors operate on a timed sequence and discharge the collected dust back into the storage bins which are equipped with two bunker seal belts to isolate the bins from the tripper deck. Average results from dust counts taken at various parts of the facility are presented. The effect of material handling design on plant housekeeping, including equipment sizing, headroom in conveyor galleries, ore transfer points, skirting arrangement, and application of dust control techniques, is described. The maintenance program at the plant is also discussed.

23101 APTIC NO. 43569

Cavan, Bruce P.

A LITERATURE REVIEW OF DUSTING TECHNOLOGY IN DEICING. *Dept. of the Army, Detroit, Mich., Corps of Engineers, RR-5-7, 46p., Dec. 1969. 77 refs.*

NTIS, DDC: AD 704709

This survey reviews the results obtained from studies conducted in North America, Europe, and Asia on the effectiveness of various dusting materials in melting an ice cover. The commonly used dusting materials were coal dust, cinders, fly ash, sand, and carbon dust. Field tests indicated that a grain size range of 0.2 to 2.0 mm is the most effective working size with concentrations of 1,000 g/sq of all sizes of material proven to be effective in hastening ice and snow melting. For maximum results, dusting must be carried out just prior to natural break-up of the ice while air temperatures are close to 32 F. The studies are indexed by country, author, materials, concentrations, and the average grain size. The appendices contain an index of techniques and abstracts of the reviewed articles.

23102 APTIC NO. 43481

Chapman, Frank E., Jr.

ATTAINMENTS IN REDUCING AIR POLLUTION. *Preprint, 9p., 1971. 5 refs. (Presented at the National Plant Engineering and Maintenance Conference, 23rd, Philadelphia, Pa., Jan. 24-27, 1972.)*

The Pemco plant manufactures frits (special glasses used in porcelain enamels and ceramic glazes) and produces from 600 to 700 different formulation each year. To meet emissions requirements, the plant was requested to eliminate an opaque white plume issuing from one of the smelters and to eliminate fluoride-bearing compounds emitted from the stack. Because fluorine was present in the stack emissions, a wet control system was necessitated. Letters were sent to 21 companies requesting a firm quote on venturi-type scrubbers, each system to consist of five separate gas-cleaning systems. Only one gas- scrubbing device consisting of a quench unit, a venturi scrubber, and a separator unit is to be initially installed in order to determine the following: the need for debugging of the air pollution control equipment; the effect on visible plume; the effect on particulate emissions; the effect on lead, fluoride, and nitrogen oxide emission; the effect on water pollution; the effect on water economics; the proper sizing of the pressure drop in the venturi throat; and possible methods of increasing the number of smelters per system. A synopsis of a computer model study of the plant pollution run by the Baltimore Systems Department is presented.

23103 APTIC NO. 43328

Chopey, Nicholas P.

TAKING COAL S SULFUR OUT. *Chem. Eng., 79(16):86, 88, July 24, 1972.*

A basic stumbling block in coal sulfur removal is the form in which sulfur is found in coal. In a typical grade, about half the sulfur is present as inorganic pyrite in simple mixture with the other constituents; the rest is locked into organic molecules. The pyrite form is widely considered the easier by far to remove, and several approaches are under study. Most pyrite-removal methods take out virtually none of the organic sulfur. Almost all processes mentioned for removing organic sulfur also modify the structural matrix of the coal, so that the desulfurized product physically is not fully interchangeable with coal. Physical methods for pyrite removal are based on the fact that pyrite is heavier than coal, and involve some form of washing. Humphreys spirals and wet concentrating tables alike are effective in lowering the pyrite content. Froth flotation with the aid of xanthate flotation promoter is also attractive, provided that two flotation stages are used. In a new chemical technique under development, coal is contacted with ferric sulfate solution at around 100 C; the solution selectively oxidizes the pyritic sulfur without oxidizing the rest of the coal matrix. The freed sulfur can be removed from the coal by vaporization or solvent extraction. The spent solution containing both ferrous and ferric ions, can be regenerated by such methods as air-oxidation. Techniques being developed for organic-sulfur removal involve contacting of coal with solvents that tend to selectively dissolve the portion of the coal matrix that is richer in organic sulfur; a mild oxidation of pyritic-free sulfur with air, causing the organic sulfur-containing molecules to form sulfones; slurrying the coal in tar or a heavy oil and then passing the slurry rapidly through a fixed bed of ammonium molybdate in the presence of hydrogen; use of a highly aromatic solvent to dissolve and depolymerize the coal in the presence of hydrogen at about 850 F and up to 2000 psi; and production of a liquid fuel from coal by means of upstream solvent- extraction. Costs for the various methods are cited.

23104 APTIC NO. 42831

Chrusciel, Romuald

POLISH EMERGENCY METHOD FOR AMMONIA-GAS NEUTRALIZATION OF THE BOILER EXHAUST GASES. *Polish Tech. Rev., no. 2, p. 16-18, 1972. 8 refs.*

The Polish emergency method for ammonia-gas neutralization of boiler exhaust gases is discussed. The method involves the introduction of ammonia into the sulfur dioxide-containing exhaust gases and the emission of the reaction products together with the remaining components of exhaust gases to the atmosphere. The applicability of the method for the protection of the biosphere was confirmed by a series of tests of the effect of the ammonia neutralized products of exhaust gases on animal organisms, plant vegetation, the physico-chemical properties of soil, biological life in water, and atmospheric corrosion processes. The operating features of the Polish method are reviewed. Costs of the method are considered.

23105 APTIC NO. 42842

Cimino, A. and F. Pepe

ACTIVITY OF COBALT IONS DISPERSED IN MAGNESIUM OXIDE FOR THE DECOMPOSITION OF NITROUS OXIDE. *J. Catalysis, 25(3):362-377, June 1972. 39 refs.*

The catalytic decomposition of nitrous oxide was studied over a cobalt oxide and magnesium oxide solid solution (Co content from 0.05-50 atoms/100 Mg atoms), and over pure CoO. The activity per cobalt ion increases with dilution, and the apparent activation energy ranges from 17 kcal/mole on the most dilute solid solution to 29 kcal/mole on the most concentrated one and on pure CoO. Oxygen adsorption measurements taken during N2O decomposition or obtained directly from molecular oxygen suggest the existence of at least two forms of adsorbed oxygen. Higher oxygen coverages are achieved when N2O is decomposed, and the result is discussed in terms of ionic interaction. The role of the matrix in oxygen desorption is examined; peroxy-ion formation is suggested as a possible mechanism. A comparison of the strength of the Co or nickel-oxygen adsorption bonds on CoO-MgO and NiO-MgO solid solutions is presented and discussed in terms of electronic configuration. (Author abstract modified)

23106 APTIC NO. 42380

Clardy, Edwin K. and Wilbur G. Regains

GAS PURIFICATION APPARATUS. *(Phillips Petroleum Co., Bartlesville, Okla.) U. S. Pat. 3,653,844. 3p., April 4, 1972. 11 refs. (Appl. Feb. 2, 1970, 1 claim).*

Gaseous stream purification apparatus is described which comprises a catalyst-containing conduit and heating means. The apparatus is particularly useful for purification of the air supplied to flame ionization detectors, the air being purified of all contaminants which interfere with the performance of the detectors. The nature of the catalyst deposited on the ceramic of the ceramic-lined conduit will depend upon the nature of the impurities to be removed. The conduit is coiled around the heat source to provide a heating surface sufficient to raise the temperature of the gas passed through the conduit to about 1400-1450 F.

23107 APTIC NO. 43138

Cochran, Neal P.

CURRENT STATUS OF COAL GASIFICATION. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, Inc., Dallas, Tex., Soc. of Petroleum Engineers, 4p., 1971. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Society of Petroleum Engineers, Annual Fall Meeting, 46th, New Orleans, La., Oct. 3-6, 1971, Paper SPE-3585.)*

Any process for converting coal to pipeline quality gas involves increasing the ratio of hydrogen to carbon in the coal. This hydrogen comes from water and the energy for the reaction comes from oxidation of some portion of the carbon to carbon dioxide. Any coal gasification process includes primary gasification, water-gas shift, acid gas removal, methanation, and a final drying to produce methane. Research and development of a number of potential coal gasification processes being sponsored by the Office of Coal Research are indicated. Construction of one plant at the Institute of Gas Technology has been completed, and the Carbon Dioxide Acceptor Process plant is nearing completion at Rapid City, S. D. The Bureau of Mines Synthane Process is being designed for construction at Brucetown, Pa., and designs are completed for Project BI-GAS which will be constructed at Homer City, Pa. As to cost, it is estimated that a 250 million standard cu ft per day plant will cost $150-$250 million.

23108 APTIC NO. 43649

Collins, J. J., W. C. Miller, and J. E. Philcox

THE PURSAIV HG PROCESS FOR MERCURY REMOVAL AND RECOVERY FROM VENT GAS STREAMS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 9p., 1972. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-27, 1972, Paper 72-186.)*

The PuraSiv Hg processes is an economical method for the recovery of mercury in elemental form from vent gas streams, without any secondary pollution problems. The specific application of the system described is for the treatment of by-product hydrogen and end-box seal air from chlorine plants. Three separate skids make up the total Pura Siv Hg Process: the blower skid, the chiller/ demister skid, and the adsorption skid. These skids, mounted in tandem, require only process and utility connections at the battery limits, plus foundation pads. The hydrogen first enters the blower skid, where its pressure is increased by 4-5 psi. The compressed gas passes through the knock-out pot to the chiller/ demister skid, which consists of a packaged chiller unit, a chilled water heat exchanger, and a Petersen separator. As the hydrogen cools, water and elemental mercury mist are formed. These mists are removed in the Petersen separator and recycled to the chlorine plant as a liquid stream. The separator itself consists of stacks (or candles) of ring elements specially contoured to act as converging-diverging nozzles. The mist particles collect on the diverging side of the rings and are washed away with spray liquid. The low-mist content hydrogen leaves the separator and enters the adsorption skid. This unit consists of two adsorber vessels, plus related equipment. Gas enters the bottom of the on-line vessel and flows upward through the bed. The remaining mercury is trapped. After breakthrough occurs, the on-line bed must be regenerated. Hot gas strips out the mercury, and this relatively concentrated stream is recycled through a water cooled heat exchanger, a knock-out pot, and finally into the suction of the blower. Final recovery of the stripped-out mercury occurs in the demister. PuraSiv systems will provide effluent mercury levels averaging less than 60 ppbv for three years. The systems can be applied to mercury ore furnace stack gases, vent streams from laboratory glassware calibrating stations, and vent gases from battery disposal or incineration operations. Total skid cost are $177,000, and the total direct operating costs are $5680 per year, assuming a five-year adsorbent life and taking credit for recovery of elemental mercury at $2.30 per pound.

23109 APTIC NO. 42990

Collins, T. T., Jr.

THE VENTURI-SCRUBBER ON LIME KILN STACK GASES. *TAPPI, 42(1):9-13, Jan. 1959. 24 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Annual Meeting, 43rd, New York, Feb. 17-20, 1958.)*

The literature on dust losses and scrubbers for lime kilns is reviewed. Comparative test data are given on a number of units, including the Pease-Anthony venturi scrubber and a recent modification of that unit, the CHEMICO S-F venturi scrubber. This device differs from the conventional venturi scrubber in that a wet-dry lime eliminator is used and the scrubbing liquid mixed with the gas in the throat is not injected as jets from an outside manifold. Efficiencies of approximately 99% removal of lime dust are achieved at relatively low pressure drops and heavy slurries are used as the scrubbing liquor. Tests showed 63-80% removal of soda fume which is volatilized at the hot end of the kiln and has a smaller particle size than the larger lime dust mechanically entrained in the kiln gases. (Author abstract modified)

23110 *APTIC NO. 43285*

Conner, W. J. and H. W. Gebhardt

POLLUTANTS AND POLLUTION CONTROL FOR THE AGENA ROCKET ENGINE. Preprint, American Inst. of Aeronautics and Astronautics, New York, and Society of Automotive Engineers, Inc., New York, 6p., 1971. 3 refs. (Presented at the American Institute of Aeronautics and Astronautics, Society of Automotive Engineers, Propulsion Joint Specialist Conference, 7th, Salt Lake City, Utah, June 14-18, 1971. AIAA Paper 71-716.)

Bell Aerospace Company tests the Agena rocket engine on a small tract of land not too far away from inhabited roads and buildings. The total amount of pollution emitted (mainly oxides of nitrogen) is trivial in comparision with other pollution sources in the area, but pollutants are emitted in concentrated form. Pollution control is accomplished by containing the pollutants and dissolving them in water, or by obtaining acceptable atmospheric dilution in a short distance. Simple, low cost scrubbers are described for controlling vent, bleed, and purge emissions, as well as engine system modifications to limit startup and shut-down emissions. The use of micrometeorological data gathering equipment to establish acceptable firing windows is considered. Turbine exhaust disposal, liquid effluent handling, and the noise problem are discussed. (Author abstract modified)

23111 APTIC NO. 43610

Cooke, M. J. and E. A. Rogers

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSIONS OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED COMBUSTION OF COAL. APPENDIX 4. EXPERIMENTS WITH THE 12 IN CORROSION COMBUSTOR. (TASK IV). *National Coal Board, London (England), Fluidised Combustion Control Group, Office of Air Programs APTD-1084, Rept. DHB 060971, 92p., Sept. 1971. 4 refs.*

NTIS: PB 210675

A 12-inch combustor for fluidized bed combustion of coal was tested to obtain data on corrosion of evaporator and reheater materials for lower fluidizing velocities. Plant design and dimensions, instrumentation, data processing, and operating procedures are reviewed. Complete data on the effects of time of exposure and limestone dosage on operation, corrosion, flue gas contents, deposited matter, and pressure drops are presented.

23112 APTIC NO. 43203

Corn, Morton and Robert T. Cheng

INTERACTIONS OF SULFUR DIOXIDE WITH INSOLUBLE SUSPENDED PARTICULATE MATTER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 43p., 1972. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-126.)*

A laboratory study was conducted of the heterogeneous catalysis of sulfur dioxide at ppm concentrations in air by insoluble particles of calcium carbonate, vanadium pentoxide, ferric oxide, fly ash from a coal-burning powerplant, manganese dioxide, activated carbon, and suspended particulate matter from urban air. A new technique for aerosol stabilization was utilized which consisted of depositing the aerosol on Teflon beads in a fluidized bed. The Teflon beads with deposited aerosol particles were then packed into a flow reactor. Progress of the chemical reaction with deposited particles was continuously monitored by determining the SO2 concentrations in the reactor effluent with a microcoulometer. The CaCO3, V2O5, and fly ash were essentially inert to SO2 at room temperature. The Fe2O3, activated carbon, MnO2, and suspended particulate matter from urban air sorbed SO2 from air streams with up to 14.4 ppm SO2 in air. A substantial part of the sorbed SO2 was physically adsorbed. Bioassay procedures which utilize pulmonary flow resistance changes in guinea pigs to monitor response to inhaled SO2-aerosol mixtures in air have indicated the weak or non-potentiating capacity of insoluble aerosols as contrasted to soluble aerosols. Potentiating response of an aerosol appears to be strongly associated with reaction of SO2 in a water droplet containing aerosol ions and not with physically adsorbed SO2 on an insoluble aerosol. (Author abstract modified)

23113 APTIC NO. 43676

Cottrell, S.

CONTROLLING AIR POLLUTION AT A FERTILIZER PLANT. *Southern Assoc. of Science and Industry, Inc.; Texas Chemical Council; and Manufacturing Chemists Assoc., Inc., Proc. Ind. Wastes Conf., Houston, Tex., 1954, p. 199-205. (April 21-23.)*

The Mathieson Chemical Corporation, located in Houston, Texas, has completed an extensive program to alleviate air pollution caused by its fertilizer and sulfuric acid plants. These installations were contributing dust, corrosive gases, and disagreeable odors to the air. To solve the dust problem, several bag type dust filters were installed, and they quickly reduced the escape of dust to negligible proportions. The amount of dust recovered was so great that it paid for the filters, and external corrosion of Mathieson s buildings and apparatus was noticeably reduced. In the sulfuric acid plant, the volume of escaping sulfur dioxide gas fumes, ranged upwards of 40,000 cu ft/min. A two-stage ammonia scrubber, converting the acidic values in the exit gases to ammonium sulfate, was installed, and the corrosive escaping gases have been eliminated. The disagreeable odors, caused by the plant resulted from the spent alkylation acid which is utilized in the fertilizer manufacturing process. A large incinerator is presently being installed which will heat these odorus gases to 1500 F, and thereby completely destroy the offensive odors in the exit gases.

23114 APTIC NO. 43581

Cox, D. G. and J. Highley

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSION OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED COMBUSTION OF COAL. APPENDIX 1. EXPERIMENTS WITH THE 36 IN COMBUSTOR. (TASK I). *National Coal Board, London (England), Fluidised Combustion Control Group, Office of Air Programs APTD-1083, Rept. DHB 060971, 214p., Sept. 1971.*

NTIS: PB 210674

A 36-inch combustor for fluidized bed combustion of coal was tested under varying conditions to determine the effects of operating variables on emissions of sulfur oxides, nitrogen oxides, and particulates. The design and dimensions of the combustor; instrumentation for air, gas, and water flow rate, bed height control and measurement, and continuous gas sampling; operating procedures; and data processing methods are examined. Data on the effects of bed temperature and calcium/sulfur mol ratio, varying fluidizing velocity, different coal texture and limestone size distributions, dolomite as an additive, and different coal types on sulfur dioxide emissions are presented.

23115 APTIC NO. 43609

Cox, D. G., D. C. Davidson, J. Highley, and J. C. Holder

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSION OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED BED COMBUSTION OF COAL. APPENDIX 5. EXPERIMENTS WITH THE 6 IN COMBUSTOR. (TASK V). *National Coal Board, London (England), Fluidised Combustion*

Control Group, Office of Air Programs APTD-1084, Rept. DHB 060971, 118p., Sept. 1971.

NTIS: PB 210675

A 6-inch combustor for fluidized bed combustion of coals was tested to obtain data on sulfur retention for a range of coals and limestones. Plant design and dimensions, instrumentation, data processing, and operating procedures are reviewed. Complete data on the effect of coal type, additive, bed depth and temperature, and additive size on sulfur retention and general operation are presented.

23116 APTIC NO. 43191

Cross, Frank L., Jr.

WHAT S NEW IN AIR POLLUTION CONTROL TECHNOLOGY? Preprint, 17p., 1972. 6 refs. (Presented at the Pollution Engineering and Equipment Exposition and Conference, Chicago, Ill., May 23-25, 1972.)

Three levels of air pollution control technology are available. They are emission control with add-on devices to stacks, such as electrostatic precipitators, venturi scrubbers, and baghouses; pollution abatement by in-plant or source control, such as fuel substitutions; and environmental protection by the relocation of industries, rerouting of major highways in urban areas, and the formation of green belts and buffer zones. The major thrust in air pollution control will be control of automotive emissions and control of sulfur dioxide emissions from fuel combustion in stationary sources, industrial processes, and solid waste disposal. Sulfur oxides control processes include the wet lime/limestone scrubbing process, wet magnesium oxide scrubbing, and catalytic oxidation. Other pollutants considered for control are nitrogen oxides, particulates, and odors. Federal performance standards four source categories and costs to implement them are considered.

23117 APTIC NO. 43260

Curran, George P., James T. Clancey, Carl E. Fink, Bedrich Pasek, Melvyn Pell, and Everett Gorin

DEVELOPMENT OF THE CO2 ACCEPTOR PROCESS DIRECTED TOWARDS LOW-SULFUR BOILER FUEL. *Consolidation Coal Co., Library, Pa., Research Div., Office of Air Programs Contract EHSD-71-15, APTD-1157, 218p., Nov. 1971. 59 refs.*

NTIS: PB 210840

The economic and technical feasibility of adapting the carbon dioxide acceptor process to producing low-sulfur low-Btu power plant fuel by the gasification of bituminous coals was studied. Atmospheric versus pressure operation of the gasifier for preparing low-sulfur boiler fuel gas for an existing boiler was compared; capital and operating costs were estimated for two conceptual variation of the CO2 acceptor process. Pressure operation not only produced a cheaper fuel gas but also effected a more efficient overall sulfur removal. The sulfur removal efficiency can be as high as 96% from a coal containing 4.3% sulfur. The utilization of the high pressure clean producer gas in an improved combined cycle power plant was examined with respect to capital and operating costs estimated for two different conceptual power cycles. The integrated process has the potential of producing power at a lower cost, with lower emissions of sulfur dioxide and nitrogen oxides, and with higher efficiency of utilization of coal than is possible in a conventional station equipped with stack gas treating facilities. Complete data on costs, process operation, design, equipment, process kinetics, and experimental results are presented.

23118 APTIC NO. 42389

Darby, K. and C. Whitehead

THE PERFORMANCE OF ELECTROSTATIC PRECIPITATORS IN RELATION TO LOW SULFUR FUELS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 911-922. 4 refs. (Dec. 6-11, Paper EN 34H.)*

In the case of bituminous coals the performance of an electrostatic precipitator is dependent on the resistivity of the dust which, at temperatures following the air heater outlet, is primarily determined by the surface layer conditions. This surface layer which is probably sulfuric acid vapor is formed from the combustible sulfur in the coal and there is normally a relationship between combustible sulfur in coal and precipitator performance. Where low sulfur coal is fired and precipitator difficulties are encountered, high efficiencies can still be achieved at the cost of high capital expense, as the precipitators may need to be several times the size of those required for high sulfur coal. Alternatively, the resistivity of the dust can be reduced by varying temperature or by changing the nature of the surface layer of the dust. Of the methods discussed, changing the surface layer offers the best solution. Of the various conditioning agents which can be used to alter the surface layer of the dust, in the case of a single installation, sulfur trioxide in liquid stabilized form provides the most convenient means of producing SO3 gas, whereas, if a large base load station is to be equipped, then the sulfur burner with catalytic converter is the more economical method in terms of operating costs. Precipitators can be used satisfactorily on oil-fired boilers provided care is taken in purging the insulators, rapping rates are kept low, and suitable dedusting employed. The chief advantage of precipitators is during start-up periods when the formation of acid smut conditions are most severe. (Author conclusions modified)

23119 APTIC NO. 42779

Darrah, B. R. and V. Frega

REMOVING AIR POLLUTANTS WITH PACKED SCRUBBERS. PART I. *Plant Eng., 26(4):77-79, July 13, 1972.*

In industrial applications, removal of noxious gases from exhaust air streams is most often accomplished by bringing the air stream into contact with a liquid stream for a certain period of time. The amount of time required to transfer the noxious gas to the liquid depends on several factors, including gas flow rate, liquid flow rate, solubility of gas, mechanism of contact, and scrubber type. The liquid stream is usually water or a low cost caustic or salt solution. Scrubber equipment is designed to make the contact between the liquid and gas as intimate as possible. This is accomplished by breaking up the liquid phase into fine drops or particles by spray nozzles, or both the gas and liquid phase may be divided into films and drops by passing them through a bed of tower packing. The packed scrubber is used most often in controlling emissions of noxious gases to the atmosphere. It is available in three basic operating designs: countercurrent, cocurrent, and crossflow. Crossflow between the air and liquid streams provides several advantages: lower pressure drop, lower scrubbing liquid input rate, and better solids handling capacity. Equivalent sizes, electromagnetic waves, technical definitions, common atmospheric dispersoids, typical particle and gas dispersoids, methods of particle size analysis, types of gas cleaning equipment, terminal gravitational settling, and particle diffusion coefficients for the range of particle diameters from 0.001 to 10,000 micron are summarized.

23120 APTIC NO. 43329

Davis, Stephen R., Naeim A. Henein, and Richard R. Lundstrom

COMBUSTION AND EMISSION FORMATION IN THE STIRLING ENGINE WITH EXHAUST GAS RECIRCULATION. *Preprint, Society of Automotive Engineers, Inc., New York, 14p., 1971. 18 refs. (Presented at the Society of Automotive Engineers, National Combined Fuels and Lubricants, Powerplant and Truck Meetings, St. Louis, Mo., Oct. 26- 29, 1971, Paper 710824.)*

The combustion and emission formation in continuous combustion burners have been studied both theoretically and experimentally. The theoretical study is concerned with the combustion and emission formation in idealized sprays in quiescent air. The effects of the spray rotation and the air axial and radial velocities were examined. A model has been developed for the emission formation in an actual Stirling engine. This model showed that the incomplete combustion products are primarily formed in the heterogeneous eddies zone near the burner walls. In this region, surface combustion takes place. The nitric oxide is primarily formed in the premixed-eddies zone where microvolume combustion is believed to take place. The experimental results deal with the effect of diluting the charge by using excess air or exhaust-gas recirculation on performance and emissions. The emissions measured are the nitric oxide, carbon monoxide, unburned hydrocarbons, and carbon. The tests were conducted at 5 and 8 hp. The effect of residence time in air preheater on the different emissions has been assessed. The increase in residence time was effective at light loads and low air-fuel ratios in reducing exhaust emissions. Exhaust gas recirculation was effective in reducing the nitric oxide emissions up to approximately 40% recirculation. However, the thermal efficiency of the Stirling engine decreases with an increase in the percentage of exhaust gas recirculation.

23121 APTIC NO. 43395

Denham, Roy S. and Charles L. Jedlicka

EVALUATION OF ALTERNATIVES FOR SULFUR DIOXIDE CONTROL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1972. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-76.)*

Nomographic techniques for evaluating the economics of stack gas desulfurization, fuel desulfurization, and associated transportation costs, and the results of parametric analyses of selected stack gas control processes are summarized. Relative economics of the processes, internal and external factors affecting the process economics, and an intercomparison of these costs and the anticipated effectiveness of the processes are presented. Stack gas SO2 removal systems for which nomographs were developed included the catalytic oxidation and the modified chamber processes. Parametric cost evaluations were made for the following control processes: dry limestone, wet limestone, Tyco modified chamber, catalytic oxidation, molten carbonate, magnesium oxide, coal desulfurization, and oil desulfurization.

23122 APTIC NO. 43640

Dickinson, Thomas A.

LOW MAINTENANCE COST REPORTED FOR CUPOLA DUST COLLECTOR. *Foundry, vol. 84:112, 114-115, 117, July 1956.*

The operation and maintenance of a dry baghouse smoke control unit at a foundry are reviewed. Flue efficiency is such that the gases entering the silicon-impregnated glass fabric retainers are cooled from about 2000 to less than 430 F, low enough to assure long bag life. A firebrick-lined outlet is situated near the cupola top to feed smoke into a tee, where quench air is applied by a blower. An exhaust fan then draws gases through cooling flues to the baghouse pressure chamber. The baghouse operates under a pressure of 3-4 in. and handles up to 4 cu ft of gas/sq ft of bag area. The average lifespan of the fabric bags is well over 24 mo. Inspection and maintenance procedures are reviewed.

23123 APTIC NO. 42819

Doelling, Ralph P.

AN ENGINE'S DEFINITION OF UNLEADED GASOLINE. *Preprint, Society of Automotive Engineers, Inc., New York, 7p., 1971. 14 refs. (Presented at the Society of Automotive Engineers National Combined Fuels and Lubricants, Powerplant and Truck Meetings, St. Louis, Mo., Oct. 26-29, 1971, Paper 710841.)*

The effect of leaded gasoline on hydrocarbon exhaust emissions due to combustion chamber deposits and on valve recession was studied at very low lead levels. Similar fuel lead contents at which these deposit effects are exhibited. An engine operated on fuel containing less than 0.06 g Pb/gal did not exhibit exhaust HC emission increases associated with lead engine deposits, while emissions increased when the engine was operated on fuels containing 0.07 g/gal or higher concentrations of lead. Valve recession was not experienced when an engine was operated on fuels containing 0.07 and 0.13 g Pb/gal, but was experienced with fuel leaded to 0.04 g/gal. Similar increases in exhaust HC levels resulted from engine operation of fuels leaded to 2 and 3 g/gal. Reduction in fuel lead content to 1 and to 0.5 g/gal increased exhaust HC increases. Thus fuels containing 0.04 g Pb/gal or less may be considered unleaded, while fuels containing 0.07 g/gal and greater levels of lead must be considered leaded. Additional measurements would be necessary to determine the precise lead level between 0.04 and 0.07 g Pb/gal at which lead deposit manifestations occur. The need for exploring other factors, octane requirement increase in particular, is discussed.

23124 APTIC NO. 43202

Dok, Harry

SMOG CONTROL IN THE FOUNDRY. *Am. Foundryman, 26:46-49, Dec. 1954.*

Construction and operation details of a collection system for an electric steel foundry are presented. Smog control is defined as the collection of smoke, fumes, and dust and reducing the volume escaping into the atmosphere. Pollutants and their sources reviewed included sawdust, shavings, and dust sanders in the pattern and carpenter shops, grinding operations, sand blasting, and shot blasting; and smoke from the electric furnaces. The types of dust consist of steel particles, fine sand, and fine particles of the grinding wheels. Reclaiming and control equipment discussed are cooling towers, settling tanks, wet-type collectors, baghouses, and electric precipitators. A dry system using baghouses is described in detail.

23125 APTIC NO. 42317

Drivas, Peter J., Peter G. Simmonds, and Frederick H. Shair

EXPERIMENTAL CHARACTERIZATION OF VENTILATION SYSTEMS IN BUILDINGS. *Environ. Sci. Technol., 6(7):609-614, July 1972. 18 refs.*

Tracer experiments, involving sulfur hexafluoride, were used to obtain quantitative data regarding actual residence time distributions in rooms and hallways, as well as contamination caused by reentry of laboratory fume hood exhausts into a building. Application of a mixing factor was of use, and measured values ranged from 0.3-0.7 in small rooms without fans. One experiment involved a roof exhaust with ventilation intakes both on an adjoining roof and at ground level; in this experiment more of the exhaust reentered the ground level intake of the same building compared to the roof intake of an adjoining building. In another experiment, 20% of the fumes exhausted reentered the ventilation system. (Author abstract modified)

23126 APTIC NO. 42855

Eck, Bruno

HIGH EFFICIENCY CENTRIFUGAL FAN FOR DUST LADEN GASES. *Heating, Piping, Air Conditioning, 44(7):74-78, July 1972. 6 refs.*

The design concept is presented for a centrifugal fan to be used in ducted systems for the handling and removal of dust-laden air or gases. The fan wheel employs backwardly curved blades; and no dust, dry or moist, will adhere to them. The blade design yields a mechanical efficiency of up to 87%. Developmental work for this fan involved the solution of some serious and complex problems which are discussed here. First of all, dust had to be prevented from adhering to the blades.

Second, the inevitable abrasion due to the grinding effect of dust had to be reduced to a minimum. Some examples of dust-handling fans are considered.

23127 APTIC NO. 43212

Edwards, H. W.

INTERACTION OF NITRIC OXIDE WITH GRAPHITE. *Preprint, American Inst. of Chemical Engineers, New York, 44p., 1971. 24 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 64th, San Francisco, Calif., Nov. 28 - Dec. 2, 1971, Paper 28d.)*

The thermodynamics, kinetics, and surface chemistry of the reactions between nitrogen oxides and carbonaceous solids are examined with respect to the control of NOx emissions. Thermodynamically favored products at temperatures and gas compositions typical of combustion exhaust are nitrogen, carbon dioxide, and carbon monoxide; typical solids, however, can be slow to react. Differences in reported adsorption and kinetic data are examined in terms of possible differences in structure and surface composition of carbonaceous solids. Kinetic data for reduction of nitric oxide with a pure graphitized carbon black were obtained with a flow reactor operated differentially above atmospheric pressure within approximately 1726-9310 ppm NO in N2 over the temperature range 1027-1233 K. A simple and rapid gas chromatographic method was developed for the analysis of the gas mixtures. Approximately 79% of the NO was converted at the higher temperatures under steady-state conditions. Increasing temperature favored the formation of CO, but 120 ppm of oxygen had no detectable effect. The activation energy over this temperature range averaged 20.7 kcal/mol. Although graphitic carbons can be relatively resistant to 02 attack, the rate and extent of NO reduction by the carbon black are sufficient for consideration for NOx emission control. (Author abstract modified)

23128 APTIC NO. 42341

Fisher, Ervin and Jay Warshawsky

DUST COLLECTOR. *(Fuller Co., Allentown, Pa.) U. S. Pat. 3,653,188. 5p., April 4, 1972. 4 refs. (Appl. June 18, 1970, 15 claims).*

A dust collecting apparatus is described which comprises a housing having a plurality of filter bags mounted therein. Dirty gas flows into the inside of the bags and passes through to an exhaust conduit. The dust in the gas is deposited on the inside surface of the bags. A reverse flow of clean air is used to clean the bags; this reverse flow collapses the bags and the collected dust falls into a hopper. A baffle arrangement controls the flow of clean air, while magnetically actuated reed switches mounted on some of the bags are used to control the baffle arrangement. When the bags collapse by a predetermined amount, the reed switches open and the motor stops to prevent a further increase in the reverse air flow and a further collapse of the bags. By limiting the amount the bag collapses, it is believed that wear caused by continued collapsing can be substantially reduced. (Author abstract modified)

23129 APTIC NO. 42893

Foss, Eyvind and Sven-Erik Jonsson

PULP MILLS DON T HAVE TO SMELL. *Tek. Tidskr., 102(11):64-66, 70, 72, June 5, 1972. 4 refs.*

Processes for reducing malodorous condensates and gases from kraft pulp mills are discussed. A process involving the collection and combustion of gases containing sulfur compounds and methanol, purification in a stripping column, and burning of the gases vented from the column is described. Alternative solutions for odor elimination, including incineration in lime kilns, muffle furnaces, batch digesters, absorption, and the use of scrubbers, are reviewed. Suggestions are given for more effective BOD reduction and condensate treatment. Costs of the equipment are considered.

23130 APTIC NO. 34142

Frauenfelder, A.

NEW DEVELOPMENT IN CLEANING EQUIPMENT FOR FUMES EMANATING FROM FERROSILICON ELECTRIC FURNACES. *Tidsskr. Kjemi Bergvesen Met., 23(5):110-114, May 1963. 3 refs.*

Two different gas cleaning installations for ferrosilicon electric furnaces are described; the respective efficiencies and capital and working costs are compared. The Hydrex precipitator, though twice as expensive to buy, has 50% lower running costs than the Solivore washer because of its lower water consumption. The difference could even be higher when water and electrical energy are not as cheap as in Valmoesa, Switzerland, and when the pressure loss of the Solivore washer is greater. Gas cleaning installations for ferrosilicon plants are expensive, but since the smoke nuisance must be eliminated in populated areas, the plants must consider the respective costs. Depending on the requirements, different cleaning installations can be chosen, but the capital costs must be compared with the operating costs, maintenance, safety of operation, and cleaning efficiency.

23131 APTIC NO. 42702

Fuchs, E. J.

UNLEADED VERSUS LEADED FUEL RESULTS IN LABORATORY ENGINE TESTS. *Preprint, Society of Automotive Engineers, Inc., New York, 29p., 1971. 19 refs. (Presented at the Society of Automotive Engineers, National West Coast Meeting, Vancouver, British Columbia, Aug. 16-19, 1971, SAE Paper 710676.)*

A test program was conducted using a wide variety of laboratory oil and fuel performance test procedures in order to compare effects of unleaded versus leaded fuel. In the area of engine deposits, unleaded fuel shows a consistent pattern of allowing more varnish deposits and slightly less sludge deposits compared with leaded fuel when using the same crankcase oil. This was true even when exhaust gas recirculation was used with both fuels. Engine rust is expected to diminish with use of unleaded fuels. Although exhaust gas recirculation may reverse this somewhat, high quality crankcase oils will be able to counteract any deleterious effects of exhaust gas recirculation of rust. Spark plug life is expected to increase with future use of unleaded fuels. Exhaust valve seat wear and wear of some other engine components such as cylinder bores were exhibited with unleaded fuel. Oil thickening caused by severe oil oxidation was shown to be much less severe with unleaded fuel, even when using exhaust gas recirculation. Octane requirement increase at full throttle conditions may pose problems for unleaded fuels in low compression engines. The use of exhaust gas recirculation at part throttle decreases octane requirements to very low values where no spark knock problems with unleaded fuels would be likely. Long duration tape-controlled road simulator tests using unleaded fuels on a moderate duty type driving cycle indicated no severe deposit or wear problems. (Author summary modified)

23132 APTIC NO. 43363

Fujii, Toru

GAS FILTERING DEVICE. *(Kitai roka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-9422. 2p., April 10, 1972. (Appl. April 21, 1970, 1 claim).*

This gas filter device has a cylindrical liquid-gas mixture current passage at the top, and the lower opening is placed in a liquid tank. Inside the cylinder are many layers of filters made of a number of round rods arranged in horizontal parallels, with small gaps between the rods. Individual filters are installed by bolts and nuts on the frames on the wall. They can be simply replaced. This equipment can be used at the exhaust pipe of a venturi and can filter gas containing dust and liquid. When the gas goes through the gaps between rods, it is compressed. The compressed gas creates bubbles in the liquid; all the microparticles in the ga are eliminated, and clean gas gathers at the top of the tank to be emitted through a pipe.

23133 APTIC NO. 42616

Fukui, Saburo, Korehiko Nishimoto, Naoyuki Takahashi, Tadami Eito, Junji Takeuchi, Ichiro Shimada, Kenzo Kato, Masahiro Tadokoro, and Seiji Arao

METHOD OF ELIMINATING NITROGEN OXIDES FROM EXHAUST GAS. *(NO ganyu haigasu no naka kara NO o kyushu jokyo suru hoho). Text in Japanese. (Mitsubishi Heavy Industries, Ltd. (Japan) and Ube Kosan Co., Ltd. (Japan)) Japan. Pat. Sho 47-10843. 5p., March 31, 1972. (Appl. Aug. 24, 1967, 2 claims).*

An effective, economical method for the absorption and elimination of nitrogen oxides, and nitric oxide in particular, is presented. The feature of the invention is preliminary conversion of NO into nitrogen dioxide, and portioned treatments of the total gas instead of using one treatment tank. The system can be applied to flue gases from a nitric acid manufacturing plant, metal surface treatment plant, or nitrous acid ammonium plant. Portions of flue gases are led into an oxidation system by a blower or some other method. The oxidation tank oxidizes the gas by retaining, or by the use of activated carbon or silica gel. The gas, turned into NO2, is mixed with the main exhaust gas. The absorption system is partitioned into a number of absorption chambers with separate nozzles. The most effective number of nozzles, when the combined concentration of NO and NO2 is between several 100 and several 1000, is between three and seven. More nozzles will not increase the absorption efficiency proportionately. The total capacity of the absorption tank is designed so that the ratio of NO2 and NO should be 1.0 or slightly more than 1.0. The absorbent may be caustic soda, sodium carbonate, calcium hydroxide, ammonia, or ammonium carbonate. The absorbent is sent to the tank continuously by a circulation pump, and part of the circulated absorbent is discharged continuously after a necessary treatment. When the main component of the flue gas is NO, part of the absorbent containing nitrous acid salt is mixed with mineral acid, and a high concentrate of NO2 gas is created. This is portioned off to many treatment tanks.

23134 APTIC NO. 42339

Fuma, Eiji

HEAT ADJUSTMENT VALVE FOR ELECTROSTATIC PRECIPITATORS. *(Denkiro shujin sochiyo no netsuryo choseiben). Text in Japanese. (Hitachi Plant Construction Co., Ltd. (Japan)) Japan. Pat. Sho 47-10872). 2p., April 21, 1972. (Appl. June 16, 1965, 1 claim).*

A heat adjustment valve is described that releases the combustion heat of the gas from an electric furnace. The spontaneous ignition of carbon monoxide in the dust-containing gas from electric furnaces very often occurs. The heat evolved from the combustion raises the flue gas temperature, and eventually damages the equipment in the stack. The heat adjustment valve, which has an automatically controlled gas exit, is placed between the furnace and the dust collector. More than one valve can be used, if necessary. When the automatic ignition occurs, gas expansion due to the heat of combustion forces the valve to open, and part of the combustion is released. This releases a large amount of heat and solves the problem.

23135 APTIC NO. 43241

Gallaer, C. A.

FOR ASPHALT PLANT OWNERS: FINE AGGREGATE RECOVERY AND DUST COLLECTION. *Roads Streets, vol. 99:112-113, 116-117, Oct. 1956.*

The source of dust most difficult to control for an asphalt plant is the discharge stack of the aggregate dryer. The design features which make for efficient drying also cause high dust carryover is the gas discharge. Most asphalt plant dryers are equipped with cyclone collectors which collect coarse dust particles more efficiently than fine ones. None can collect very much material finer than one micron in diameter. High efficiency cyclone dust collectors cannot, by themselves, reduce the exit dust concentrations to levels acceptable by most municipal dust codes. If it is necessary for a particular plant to conform to a rigorous dust code, that plant must install second stage dust collection devices. If water supply and sludge disposal facilities are adequate, a scrubber or wet cyclone is the most economical means abailable. The only remaining alternative is the installation of an electrostatic precipitator which, though initially quite expensive, will, in the long run, provide a very satisfactory solution to the stack discharge problem.

23136 APTIC NO. 42998

Gallear, C. A.

DUST COLLECTING SYSTEM IN SINTERING PLANT REDUCES COST. *Blast Furnace Steel Plant, 43(7):1381-1382, Dec. 1955.*

Savings of more than $1500 monthly, as well as an overall efficiency of 92.5%, are achievements of the latest dust reclamation system installed at a large sintering plant located at one of Pennsylvania s steel mills. Efficiency refers to the percentage by weight of particles removed from ccombustion gases before exhausting to the atmosphere. The dust collector comprises six cyclone-type units arranged in the shape of a large V, three cyclones to each leg of the V. Within the cyclones, the solids are thrown by centrifugal action to the cyclone wall and due to the air flow pattern, which is a descending helix at the cylinder periphery, the dust is carried downward and discharged through conical outlets into the hopper below. The cleaned gas ascends in a helical manner at the center of the cyclone and leaves through the outlet pipe which extends down into the cylinder. From the hopper, the reclaimed fines are conveyed back to the sintering plant. The major factor in providing greater collector efficiency is a narrow vertical rectangular port in the upper portion of the collector. This port provides an immediate outlet for fines which tend to accumulate in eddy currents which prevail in this portion of the collector. Maintenance costs are indicated.

23137 APTIC NO. 42983

Genton, Richard, G.

STEEL MILL SINTER PLANT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1972. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-81.)*

Tests were conducted on electrostatic precipitators, high- energy wet scrubbers, and bag filters which indicated that a bag filter system would be the most efficient and require the least operating costs. The operation of a sintering process and methods available to control the dirty gases to satisfy air pollution codes are discussed. The aspects and problems inherent to self-fluxing sintering operations are covered. Test gases contained, among other items, submicron particles, products of combustion, water vapor, sulfur oxides, and other constituents typical of a sintering process. In a bag filter, concentrations ranging up to 0.85 grains/cu ft of gas were experienced. Outlet dust concentrations, after being filtered by the bag filterhouse, are in the range of 0.0004 grains/ standard cu ft. Automation of the bag filterhouse to operate unattended is an important aspect of the current state of the art. The interactions of bag-filter life versus pressure resistance to air flow have been determined. A bag filterhouse will function satisfactorily and meet air pollution codes for filtering of toxic, high-temperature, and corrosive gases. (Author abstract modified)

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23138 APTIC NO. 42890

Geny, P.

ACHIEVEMENT OF IRON METALLURGY. (Les realisations de la siderurgie). Text in French. Pollut. Atmos. (Paris), 14(54):184n 187, April-June 1972.

The state of the art of air pollution control in the iron metallurgy of France is outlined. Dust emissions, ranging in grain size from 1 to 100 micron, are controlled by dry and wet separation techniques. Electrostatic and particularly tissue filters are efficient, though the latter cannot be applied in certain cases. Wet electrostatic dust separators and venturi scrubbers belong to the wet separation techniques. Dust separation is technically possible but not always economical. Carbon monoxide, formed in large quantities, is generally utilized in furnaces. Red smoke emissions, containing almost exclusively iron oxides in the form of very fine particles (down to 0.01 micron), are not yet controlled satisfactorily, but an adequate solution to this problem is expected to be available in the near future. All oxygen converters are equipped with smoke control devices. The red smoke emission is presently limited to a fairly high value of 80 mg/cu m. All new facilities have been equipped with pollution control devices for the last 8-10 years. Such devices require some 10% of the total investment, and their operating costs are of the same order of magnitude. Systematic and periodical emission measurements are carried out, and meteorological and topographic parameters are investigated around iron metallurgical plants.

23139 APTIC NO. 43463

Ginodman, G. M., D. S. Glikin, and I. L. Peisakhov

A RAPID SCRUBBER FOR THE REMOVAL OF CHLORINE FROM GASES. *Tsvetn. Metal., 35(3):42-48, 1962. Translated from Russian. 10p.*

A commercial system was developed for removing chlorine gases by using milk of lime in an unpacked reverse flow scrubber with gas flow rates of approximately 5.3 m/sec. The apparatus removes 90% of chlorine from gases containing 2.5 g/cu nm of the material. It also removes acid components almost completely. This is achieved by spraying 2.4 cu m of an absorptive suspension in coarse droplets into each 1000 cu m of gas (at the exit temperature). At such sprayed surface densities, the removal of chlorine does not decrease with a decrease of calcium concentration in the absorptive suspension down to 10-12 g/l. A decrease in the sprayed surface density does decrease the degree of chlorine removal. Under these conditions, calcium hypochlorite and chloride are formed, with practically no chlorate formation.

23140 APTIC NO. 43539

Glass, R. W. and R. A. Ross

HETEROGENEOUS INTERACTIONS OF SULPHUR DIOXIDE ON SUPPORTED TRANSITION METAL CATALYSTS. *Lakehead Univ., Thunder Bay (Ontario), Dept. of Chemistry, 15p., 1971 (?). 12 refs.*

Isothermal and adiabatic heats of adsorption of sulfur dioxide on a number of supported transition metal catalysts were determined calorimetrically between 323 and 423 K. The catalysts included silica gel and ferric oxide, manganic sesquioxide, vanadium pentoxide, manganous sulfate, and nickel sulfide all supported on silica gel. Adsorption/desorption isotherms of SO2 were measured and nitrogen adsorption data determined for all solids. Preadsorption of oxygen on the supported catalysts lowered the measured heats slightly, while preadsorption of SO2 followed by oxygen admission caused immediate heat rises as high as 20 kcal/mole. It is proposed that SO2 adsorbs on silica gel through oxygen bridging to hydroxyl groups while sulfates are formed on the supported metal oxides as confirmed by chemical analysis. (Author summary modified)

23141 APTIC NO. 43482

Gommi, J. V.

REDUCED ODOR EXPERIENCE WITH CE ACE UNITS. *Preprint, American Chemical Society, Washington, D. C., 16p., 1971. 6 refs. (Presented at the American Chemical Society, Northwest Regional Meeting, 26th, Bozeman, Mont., June 16-18, 1971.)*

The kraft mill has been the source of many sulfur-bearing odorous gases such as hydrogen sulfide, alkyl mercaptans, alkyl sulfides, alkyl disulfides, sulfur dioxide, and sulfur trioxide. The recovery unit has made a contribution to this odor level. Recovery unit emission of total reduced sulfur compounds is predominantly H2S and the remaining alkyl groups are mostly methyl. This emission is primarily from two areas: the concentration of unoxidized strong liquor by direct contact with hot flue gas in a cascade evaporator or venturi scrubber; and the furnace area, particularly where furnaces are run at overload. Odors from these two sources can be minimized by elimination of direct fuel gas contact evaporation of unoxidized black liquor and proper furnace operation. Commercially available schemes for the former are gas contact evaporation, the air contact evaporator (ACE), the laminaire air heater (LAH), the large economizer, and the combined LAH-ACE. Important furnace operating parameters are black liquor oxidation, black liquor gun spray size, percent zone liquor solids fired, furnace operating load vs. design rating, furnace zone air ratios, excess air, oxidation zone turbulence, mill sulfidity, soot blowing, air temperature, furnace and bed temperature, and bed height. The experience of Chemical Engineering with the ACE unit is discussed.

23142 APTIC NO. 42908

Gonzalez, Virgilio

THE ABSORPTION OF MERCAPTANS WITH WHITE LIQUOR IN A KRAFT PULP MILL. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 864-867. (Dec. 6-11, Paper EN 34A.)*

The scrubbing of gases containing mercaptans, generated in a kraft pulp mill, with a white liquor, is a desirable process from the standpoint of odor control improvement. The process is also beneficial to the pulp quality and yield. In a conventional mill using batch digesters, its adoption to treat digester residue can lead to a 30% lowering of the odor index. The process can be used to treat other mercaptan-containing effluents such as evaporator noncondensibles. Experimental and developmental work on the white liquor scrubbing process is described. The liquor consists of sodium hydroxide and sodium sulfide. The effectiveness of this treatment is tested by an odor panel. (Author conclusions modified)

23143 APTIC NO. 43598

Grimm, R. M. and C. R. Mitchell

PREPARATION OF SOUTHERN ILLINOIS METALLURGICAL COAL. *Mining Congr. J., 55(5):21-25, May 1969.*

Research prior to the construction of the southern Illinois plant resulted in the following conclusions: (1) a rotary breaker had much the same liberating characteristics as the impact type crusher and offered several additional features; (2) the Teska separator appeared to be most suited to the washing of the plus 0.25 in. coal; (3) the Dyna-Whirlpool appeared to be most suited for washing of coal down to 0.5 mm; and (4) froth flotation would be used on minus 0.5 mm coal to maximize the yield of metallurgical coal. The raw coal, processing, and rail loading operations of the plant are described. The minus 0.5 mm particles from the drying process are carried by upward-moving hot air to four air cyclones, which centrifugally remove most of the remaining coal solids. These solids pass downward through the cyclones and are discharged by rotary gates. The upward cyclone exhaust reports to a Peabody two-stage wet scrubber, which removes the remaining ultra-fine solids as slurry, and exhausts relatively clean air to the atmosphere. The exhaust gases were guaranteed to have a particlate content of no more than 0.1 lb/1000 lbs gas, equivalent to 0.05 grain/standard cu ft.

23144 APTIC NO. 43373

Grumer, Joseph and A. E. Bruszak

INHIBITION OF COAL DUST-AIR FLAMES. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Mining and Safety Research Center, RI-7552, 14p., Aug. 1971. 15 refs.*

Nine dust and gaseous inhibitors of propagating coal dust-air flames were evaluated in a newly developed instrumented flame duct under conditions of virtual absence of wall quenching and temporal and spatially uniform dust concentrations to within about + or 5%. The inhibitors, in order of increasing efficiency, were rock dust (calcium carbonate), powdered oyster shells, (calcium carbonate), Halon 1301 (trifluorobromomethane), Halon 1211 (difluorochlorobromomethane), sodium chloride, Super-K (potassium chloride), regular grade fire extinguishant powder (sodium bicarbonate), Purple-K (potassium bicarbonate), and Monnex (potassium bicarbonate combined with urea). Experiments were extended to clouds containing 1 and 2 vol% of methane. The inhibition of lean, stoichiometric, and rich methane-air flames without coal dust was also examined. (Author abstract modified)

23145 APTIC NO. 42613

Hama, Akira

BAG FILTER FABRIC LOADING DEVICE. *(Baggu firuta ni okeru rofu toritsuke sochi). Text in Japanese. (Kurimoto Ironworks, Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 47-9406. 3p., April 10, 1972. (Appl. July 11, 1969, 1 claim).*

This utility model facilitates loading and unloading of an envelope-type filter fabric. The device consists of an outer frame which is supported by holders at the lower ends. A removable inner frame can be inserted freely into the bag filter, and a removable seal ring stabilizes the filter fabric onto the inner frame. The seal ring fits over the protrusion in the suction mouth.

23146 APTIC NO. 42647

Hamano, Tatsuji and Kikuo Takahashi

EXHAUST GAS DUST COLLECTION FILTERING MATERIAL. *(Haiki gasu shujinyo rozai). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-9412. 2p., April 10, 1972. (Appl. Nov. 24, 1969, 1 claim).*

This utility model is a filter material designed to collect dusts in any type of exhaust or flue gas effectively. It is durable and dust separation is easily achieved. The material consists of an upper layer of thick carbon fibers of 15 to 20 deniers, and the lower layer is made of thick carbon fiber twisted with thin carbon fibers into a dense web of three to five deniers. The entire material is treated with non-viscous synthetic resin and needle punches are applied to hold the layers together. The carbon fibers can be an ordinary acryl fiber or cellulose fiber slowly heated and treated at 800 to 100 C.

23147 APTIC NO. 42441

Hames, R. J., D. F. Merrion, and H. S. Ford

SOME EFFECTS OF FUEL INJECTION SYSTEM PARAMETERS ON DIESEL EXHAUST EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., New York, 10p., 1971. 8 refs. (Presented at the Society of Automotive Engineers, National West Coast Meeting, Vancouver, British Columbia, Aug. 16-19, 1971, SAE Paper 710671.)*

Products of diesel combustion, including hydrocarbons, nitric oxide, carbon monoxide, and exhaust smoke, are being controlled by current and future emission standards of federal and state governments. Fuel injection parameters such as tip design, injection timing, rate of injection, and the number and size of tip orifices were investigated with the unit injector used in Detroit Diesel engines, for influence on emissions. Injector tip design will control hydrocarbon emissions. A reduction in nitric oxide emissions by changing injection parameters is limited by increased exhaust smoke and carbon monoxide and losses in fuel economy. Emission levels with the standard injector and an experimental injector, combining several injection parameter revisions, are compared with the 1973 California emission standards for diesel engines. (Author abstract modified)

23148 APTIC NO. 43355

Handwerk, Roy J.

RECYCLING WATER EFFECTIVELY. *Foundry, 100(7):40-43, July 1972.*

Many foundrymen have found that equipment installed to eliminate air pollution creates a new maintenance problem and often a water pollution problem, as well. Special problems arise from use of a scrubber to clean air from sand-handling areas of the foundry. As the water evaporates in the sand-handling scrubber system, the calcium and magnesium in the water increase in concentration, and scale may begin to form. Prevention of scale requires use of the same types of water treatment needed for cooling towers and similar industrial equipment. Gases from the cupola are very acidic and cause circulating water in the system to become acidic, too, thus presenting a corrosion problem. Similar acidity problems occur when scrubbers are used to handle air from pouring and shakeout areas of the foundry. All scrubber systems have a common problem in that a settling tank is needed to permit gravity settling of solid materials scrubbed from the air. Effective coagulation and flocculation chemicals sometimes must be fed to settling tank to overcome the suspending action of the bentonite and to cause rapid settling of all particles. Many foundries have installed automatic feed and control equipment to monitor the addition of appropriate chemical treatments. The first step in providing water-pollution control is to determine flow rates and levels of pollution. Recycling of water and waste treatment are considered.

23149 APTIC NO. 43678

Hansel, James G.

LOW NOX EMISSIONS FROM AUTOMOTIVE ENGINE COMBUSTION. *Preprint, Combustion Inst., Western States Sect., 24p., 1971. 12 refs. (Presented at the Combustion Institute, Western States Section, Fall Meeting, Irvine, Calif., Oct. 25-26, 1971, Paper WSCI 71-33.)*

The air-fuel ratios and exhaust recycle rates in an automotive test engine were measured for the purpose of reducing nitrogen oxide emissions to low levels. Retarded spark timing was also tested. A minimum level of 0.4 g/mi on the 1972 Federal Test Procedure was obtained at a rich air/fuel ratio of 12 and a recycle rate of 25%. With this combination, the fuel consumption increased approximately 15%, and the wide open throttle power decreased about 30%. Combustion in the cylinders was good and the vehicle operated smoothly. Comparable results were not obtained with lean mixtures. The results of the study did not establish the feasibility of meeting the 1976 nitrogen oxide standard with the rich-mixture, high-recycle technique. Further, the increased carbon monoxide and hydrocarbon emissions would have to be controlled by exhaust gas treatment.

23150 APTIC NO. 43542

Hansen, Poul

AIR POLLUTION BY OIL-FIRED POWER STATIONS -- REMOVING SULPHUR FROM FUEL OIL AND FLUE GASES. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 3:42-3:49. (Sept. 1-6.)*

Removal of sulfur from fuel oil and flue gases is discussed. Several processes are described, including using a fluidized bed to remove sulfur from the oil while it burns, the use of additives in the combustion chamber, and afterburning in the stack while using liquefied petroleum gas. Costs of control equipment, its development and installation are reviewed.

23151 APTIC NO. 43365

Harada, Kenzo

AIR FILTER LOADING MECHANISM. *(Kuki rokaki no chakudatsu kiko). Text in Japanese. (Mitsubishi Heavy Industries, Ltd. (Japan)) Japan. Pat. Sho 47-9418. 3p., April 10, 1972. (Appl. June 23, 1970, 1 claim).*

This utility model uses a magnetic catch for the installation of an air filter on an air conditioner or room cooler, facilitating the loading and unloading of the equipment. For most filters, installation is by means of groping for pins on the sides of the conditioner where one cannot see. Instead of a pin, a magnetic catch is attached to a fixed board, made of a nonmagnetic material such as aluminum. The filter can be held by a handle, placed on a guiding board, and pushed toward the air conditioner. As the lower part of the magnetic catch is adhered to the fixed board, the filter is firmly fixed on the filter holder in the back.

23152 APTIC NO. 43440

Harle and Lechopiez

PROCEDURE FOR THE ABATEMENT OF SULFUR DIOXIDE IN GAS MIXTURES. *(Procede pour reduire la teneur en SO2 de gaz qui en contiennent). Text in French. (Esso Research and Engineering Co., Inc.) French Pat. 2,043,732. 14p., Feb. 19, 1971. (Appl. May 27, 1970, 15 claims).*

The method described is designed to desulfurize fuel oil or other combustion gases. Part of the sulfur dioxide present in the gas is reduced to hydrogen sulfide by heated fuel oil with alumina as catalyst; H2S reacts with SO2 yielding liquid and solid elementary sulfur which accumulates at the bottom because of its higher density. Fuel oil or fractions from catalytic cracking of a boiling point between 65 and 485 C are suitable for the reduction process, which takes place at temperatures between 200 and 425 C, preferably at 260-370 C. The combustion gas is used to heat the oil to the desired temperature. The reaction can take place in an empty chamber where the combustion gas is brought countercurrently into contact with vaporized heated fuel oil, or the combustion gas can bubble through a layer of heated fuel oil in a tank. The mixture of the combustion gas with vaporized fuel oil is subsequently cooled in a heat exchanger where the sulfur separates in the condensed fuel oil. If SO2 reduction with the oil produces more H2S than can react with the remaining unreduced SO2, then an additional stoichiometric amount of combustion gas is added to the vaporized mixture. The vaporized desulfurized mixture can be further desulfurized in a reactor filled with an aluminum catalyst, or the aluminum catalyst can be added in granular form to the oil tank where primary desulfurization takes place; this always produces a higher degree of desulfurization than is achieved with oil only. The catalyst has a limited life at a good working temperature (427 C, for example) and it is advantageous to reactivate it in situ in the tank by steam or by an inert gas at temperatures below the decomposition temperature of the oil. If the catalyst is strongly carbonized it must be reactivated by heating to 815-985 C. Following the separation of sulfur the oil from the cooler is returned to the process.

23153 APTIC NO. 43645

Harsell, T. L., Jr.

LOS ANGELES FOUNDRYMEN TEST AIR POLLUTION CONTROL EQUIPMENT. *West. Metals, no. 3:25-27, March, 1950.*

Studies to determine the amount and characteristics of cupola emissions in the Los Angeles area and their reduction are reported. Data were collected on the size of cupolas, blast volumes, melting rates, charge, and charging methods. Control equipment tested for its efficiency included wet scrubbers, centrifugal dry collectors, filtration (bag house), and electrical precipitators. Tests were conducted under cupola-operating conditions. Efficiency results of wet scrubbers and precipitators are discussed. It was concluded that all cupolas in the district were in violation in regard to particulate matter discharged into the air, and that at present there is no known collector which will solve this problem and still be within economical limits of the foundries.

23154 APTIC NO. 42816

Hayashi, Isao

REDUCING THE SIZE OF ELECTROSTATIC PRECIPITATORS. *(Denki shujin sochi no kogataka ni tsuite). Text in Japanese. Boira Gishi (Boilermen), 27(4):1-11, April 1972.*

A modified electric dust collector was developed to overcome the inability of previous precipitators to collect particles smaller than 0.1 mm o in size. A needle electrode, 0.02 mm o in diameter, is used for vigorous corona discharge to prevent particulates with opposite charge from adhering to the needle electrode. Due to the low voltage between electrodes, reverse corona discharge will not occur between electrode and particulates, and because of the short distance between the electrode plates, very small particles pass through the two plates at high velocity and are collected at high efficiency. The size of the collector was also reduced by minimizing the condenser. This provides a low cost collector, particularly when expensive materials must be used, e.g., for the collection of corrosive substances.

23155 APTIC NO. 42622

Hayashi, Kenzo

DOUBLE HEADED AIR CLEANER. *(Soto kuki seijoki). Text in Japanese. (Joban Electric Appliance Co. (Japan)) Japan. Pat. Sho 47-7355. 4p., March 17, 1972. (Appl. April 24, 1969, 1 claim).*

This air cleaner is designed for the workshops and plants of spinning mills, lumber mills, cement factories, casting foundries, coal mines, and outdoor repositories for construction materials. It is a relatively small, compact suction filter device with strong suction power. The cleaner has suction pipes on both sides, one filtering chamber on each side, and a dust collection chamber with an opening in the center which is connected with an exhaust duct. In the dust collection chamber are layers of zigzagged filters. In the filter chamber, there are many U-shaped dust collection boxes arranged in a bow shape, behind which is created a negative pressure. When the fan is operated, a strong suction is created in the exhaust duct and the air is sucked in through the chambers, and the dust-containing air is sucked in from the entrance to the suction pipe. The dust in the air goes through the U-shaped partition boards arranged in a bow shape, and large dusts are caught behind the U-shape because of the negative pressure. Smaller particles are captured by many layers of zigzagged filters. The filters can be made of glasswool, synthetic fibers, felt, steelwool, or activated carbon, according to the needs of each factory environment.

23156 APTIC NO. 43362

Hayashi, Kenzo

FILTER ATTACHMENT DEVICE FOR MICROPARTICLES IN GASES OR ATOMIZED PAINT. *(Gokiryo no bijin matawa toryo mukaryushi nado no rokatai toritsuke sochi). Text in Japanese. (Joban Electric Appliances Co., Ltd. (Japan)) Japan. Pat. Sho 47-7356. 3p., March 17, 1972. (Appl. May 8, 1969, 1 claim).*

This utility model is to be installed in the filter device or air cleaner of a paint plant, where dust-containing air or aerosol paint can be filtered effectively by a zigzag arrangement of these filters. The loading of the filters is very easy and the cleaning recovery of the filter material is also simple. The frame is made of aluminum or some other light metal, rigid plastic, or wood, in an oblong or right square. The top and the lower sides have parallel rail channels outside, and hooking channels inside. The filter material to be loaded on this frame is made of an outer package of wire mesh which is stuffed with an appropriate filter material chosen according to individual needs, such as glasswool, chemical fiber, felt, steelwool, or activated carbon.

23157 APTIC NO. 43330

Hinton, M. G., Jr., T. Iura, W. U. Roessler, and H. T. Sampson

EXHAUST EMISSION CHARACTERISTICS OF HYBRID HEAT ENGINE/ELECTRIC VEHICLES. *Preprint, Society of Automotive Engineers, Inc., New York, 12p., 1971. 9 refs. (Presented at the Society of Automotive Engineers, National Combined Fuels and Lubricants, Powerplant and Truck Meetings, St. Louis, Mo., Oct. 26-29, 1971, Paper 710825.)*

As part of a study to ascertain the feasibility of hybrid heat engine/electric automotive vehicles, exhaust emissions were calculated to determine both the state-of-the-art and the potential emission capability of vehicles in incorporating the battery/heat engine powerplant. Vehicle emissions were determined for four vehicle classes: full-size family car, small commuter car, delivery/postal van, and the city bus. Specific mass emission data, in terms of gm/bhp-hr, were gathered for the spark ignition, diesel, gas turbine, Rankine cycle, and the Stirling cycle engines. Data inputs required the determination of steady-state mass emission data at rated-load as well as part-load operating conditions. These data were utilized to calculate the exhaust emission characteristics of the passenger car and commuter car driving over the Federal LA-4 driving cycle. Emission data for the delivery van and city bus were calculated over an arbitrarily selected driving cycle. The results indicate that marked reductions in emissions can be obtained with the spark ignition engine operating at lean air-fuel ratios which is permitted by the steady-state operation characteristic of the hybrid. For the future, the gas turbine shows promise of further emission reductions, and the diesel engine also shows promise in some areas.

23158 APTIC NO. 42668

Hirakawa, K.

PRESENT STATE AND FUTURE PROBLEMS OF SMOKE DESULFURIZATION TECHNOLOGY (I). *(Haien datsuryu gijutsu no genjo oyobi kongo no kadai (Sono 1)). Text in Japanese. Denki Kyokai Zasshi (J. Japan Elec. Assoc.), no. 580:61-65, 1972.*

To combat the increasing air pollution, the Japanese government set up in 1969 the criteria for sulfur content of fuel oil to be achieved by 1973 and 1978. For example, the criteria are 1.25% and 0.80%, respectively, for fuel oil used in the area where anti pollution measures are required. To this end, Japan has made efforts to import low-sulfur crude oil in the past years. Although the average sulfur content of Japan-imported crude oil is decreasing by 0.1% or so each year since 1965, this trend will not go on after 1972 due to a limited supply of low-sulfur crude oil. So, desulfurization of fuel oil is necessary. However, the present fuel desulfurization process can reduce sulfur content only to 1.0- 1.2% at best, and the indirect desulfurization to 1.5-2.0%. Therefore, smoke or stack gas desulfurization is essential in order to satisfy the pollution control criteria. Use of LNG (liquefied natural gas) is planned. With all the LNG import programs of Japanese importers materialized, Japan will be importing 40 billion cu m of it by 1977. The smoke desulfurization plants operating by 1973 will take care of 1.7 million kl of fuel in terms of heavy oil. This, however, amounts to only 1% of total fuel quantity. Smoke desulfurization technology should provide a high desulfurization rate, high absorption and adsorption of SO2, production of marketable byproducts, no adverse effects to operation of the main plant, and cause no secondary pollution with dust and effluents.

23159 APTIC NO. 42639

Hirayama, Toshio

DUST FILTER. *(Dasuto firuta). Text in Japanese. (P. S. Industries, Co., Ltd. (Japan)) Japan. Pat. Sho 47-9410. 2p., April 10, 1972. (Appl. Oct. 29, 1969, 1 claim).*

This utility model is a doughnut type ring dust filter used on a humidifer over its water tank. The dust filter is made of polyurethane foam sheet of appropriate thickness wrapped around an anti-corrosive wire spiral spring, which fits around the cylinder of a humidifier over its water tank. The two edges of the polyurethane foam sheet are joined by the velvet-type fastner (called magic tape). When the filter is clogged by dust, the fastner is easily separated and the filter can be washed as a sheet of fabric, returned to the spiral spring, and used again.

23160 APTIC NO. 43446

Hishida, Kazuo, Kinzo Nakano, and Minoru Takeda

CHARACTERISTICS AND TREATMENT OF WASTE GAS FROM AEROSOL PAINT PROCESSING. *(Funmu toso ni tomonau hai gasu no seijo to taisaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):82, 1969. (Presented at the Japan Society of Air Pollution, Annual Meeting, 10th, Tokyo, Japan, 1969, Paper 81.)*

Seventy-seven complaints against aerosol paint, which were 40.5% of the total complaints in 1968 against air pollutant industrial dusts, and 65 complaints against paint solvent odor, which was 13.4% of the total 1968 complaints against industrial odors, show a high rate of problems with aerosol paint processing. Generally, paint already has approximately 50% solvent in it, and 20 to 100% more thinner is added immediately before the use, increasing the surface area per unit particle of microparticles of paint. This enhances evaporation. The emission cannot be collected by a wet booth alone, so it has to be discharged in the air through an exhaust pipe. Either a wet (water scrubbing) or dry (filter) treatment and exhaust pipe are necessary in order to maintain the maximum concentration of less than 150 mg/N cu m, a mean concentration of approximately 75 mg/N cu m. Aerosol paint booths of most scales and types are available. The emission from the exhaust pipe should maintain a 1/10 level of the labor environment maximum concentration, or 1/100 of the hour-average concentration permitted by the labor law. When concentration exceeds these levels, the organic solvent emission should be reduced by combustion, adsorption, or contact oxidation.

23161 APTIC NO. 43480

Hough, G. W. and R. L. Stewart

EMISSION CONTROL OF EXISTING KRAFT RECOVERY SYSTEMS. *Technical Assoc. of the Pulp and Paper Industry, New York, Tappi Eng. Conf., 26th, Proc. 1971, p. 83-95.*

Air emission control from the evaporators and recovery furnace in existing mills is discussed. Complete black liquor oxidation is required to control odor emissions from the miltiple effect evaporators and the direct contact evaporator. Without it, elimination of the direct contact evaporator is required. Control of emissions from the recovery furnace is dependent upon type of equipment and operating conditions. A venturi scrubber will not meet the most stringent particle emission regulations, and an electrostatic precipitator must have a 99% collection efficiency to meet present day standards. The efficient removal of particulates from the recovery stack will

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reduce the visibility of the plume. Installation of most emission control equipment in an existing mill cannot be economically justified.0

23162 APTIC NO. 43646

Howells, W. H.

CUPOLA DUST COLLECTOR. *Foundry, 78(5):242, 244, May, 1950.*

A detailed description of a twin-cupola collector and its operation is presented. The collector accomodates the exhaust from two cupolas which alternate daily in their operation. Most of the collection equipment is mounted on the roof. The system provides for the collected material to be piped to a 3600 cu ft storage hopper. A two-way damper controls the flow from either cupola into the primary separation chamber. A 20,000 cfm fan exhausts the gases from this chamber through the openings in the cones and expels them into the atmosphere through a 25 ft stack. The particles to be collected resist the change of direction which the gases take and continue to flow at a highly accelerated velocity. The particles are carried to the secondary collector, a simple cyclone, where they are settled out. The finer particles are then recirculated by a 1000 cfm blower to the primary collector. Collection figures and an analysis of the material collected are given.

23163 APTIC NO. 42800

Ichioka, Tatsuro

AUTOMATIC DUST SHAKING (BRUSHING) DEVICE FOR ELECTROSTATIC PRECIPITATOR. *(Denki shujinki no jido chiriotoshi sochi). Text in Japanese. (Horiba Mfg. Co., Ltd., Kyoto (Japan)) Japan. Pat. Sho 47-1184. 2p., Jan. 17, 1972. (Appl. July 26, 1968, 1 claim).*

This invention relates to a simple automatic dust shaking device which requires less power and does not affect the discharging poles of the precipitator. A steel net is knitted with steel wires which are connected to pliant air pipes at both sides. Compressed air is introduced intermittently into the pipes. By introducing and releasing the air, the pipes are caused to expand and contract, thus moving the wires and the steel net. Thus, the dust collected on the net falls due to the shaking.

23164 APTIC NO. 42670

Iinoya, Koichi and Kazutaka Makino

DUST COLLECTORS TODAY AND TOMORROW. *(Shujin sochi no genjo to kongo no doko). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 17(5):68-74, May 1972.*

The most typical dust collecting system used with a blast furnace in the iron industry is a combination of the dust chamber, spray washer, and electrostatic precipitator. Dust concentration at the exit is 0.015 g/N cu m with the dust chamber and electrostatic precipitator. The dust chamber and venturi scrubber give higher dust collection efficiency, but pressure loss is also high. Although high pressure loss is generally a disadvantage, it is often desirable in blast furnaces. An overwhelming majority of those of over 3,000 t/d are equipped with dust chambers, scrubbers, and precipitators with an extremely small exit dust concentration and the pressure loss amounting to 600-2000 mmAq. Compared with blast furnace gas, converter gas has a much greater calorific value (2,000 kcal/N/cu m or 3 times as much) and carbon monoxide concentration of 83%. Therefore, a dust collecting system for the converter is needed to recover heat and CO. To achieve this, the system often consists of a full or half boiler and a dry-type electrical precipitator. The recent trend is the use of a wet type dust collector, especially a venturi scrubber. A precipitator is most popular for open hearth furnaces, while venturi scrubbers or bag filters are used in some cases. In thermal power plants, a dust collector is mostly a combination of a precipitator and multi- cyclone, while in the cement industry precipitators, cyclones, bag filters, and scrubbers are widely used.

23165 APTIC NO. 42416

Inoguchi, Masao, Yoshito Kaneko, Yoshihito Satomi, Kiyohiko Inaba, Harumi Nagaya, Kazuhito Tate, Takehiko Mizutori, Reijiro Nishiyama, Tsutomu Ota, and Kazuma Niume

STUDIES ON THE HYDRODESULFURIZATION CATALYST OF RESIDUAL CONSUMPTION. (PART 6). REACTION VARIABLES AND HYDROGEN CONSUMPTION. *Bull. Japan Petrol. Inst., 14(1):7-17, May 1972. 4 refs.*

The reaction variables affecting the desulfurization reaction rate, including space velocity, reaction pressure and temperature, hydrogen gas rate, and kinds of feed oil, were studied. A commercial catalyst KC-28 and some trial catalysts which showed superior desulfurization activity were used. The bench scale flow apparatus consisted of a reactor, a high pressure separator, a low pressure separator and a hydrogen sulfide absorber. The rate of desulfurization reaction was apparently second order with respect to the sulfur concentration. The apparent activation energy was about 25 kcal/mol. The rate of sulfur removal increased linearly with increasing reaction pressure in the range of approximately 50-140 kg/sq cm. The effect of hydrogen gas rate on desulfurization was relatively small in the approximate range of 500-1000 Nl/l. Khafi atmospheric residue was more difficult to desulfurize than Kuwait residue. The trial catalysts were superior to the commercial catalyst with respect to hydrodesulfurization activity and hydrogen consumption.

23166 APTIC NO. 42786

Inoue, Kan

EXAMPLES OF USING HIGH TEMPERATURE BAG FILTERS FOR DUST COLLECTORS. *(Koonyo baggu shujinki riyo no jissai). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 39(6):589- 593, June 1972.*

The design and operation of the high temperature bag filter of a dust collector for an electric furnace are discussed. Since the furnace has a high electrical power, the following system is used for cooling the gas. The gas is first cooled in a cooling chamber which decreases the temperature by 500 C. The gas then flows through a water duct and a double water cooling tower which decrease the temperature by 300 C and 220 C respectively. A glass fiber filter is used because the resulting gas is expected to have a temperature of 250 C. After two years of operation, the apparatus is still equally effective for dust collection. The collection data are dust content of the gas at the entrance of the collector, 3 to 24 g/N cu m; that at the exit, 0.003 g/N cu m.

23167 APTIC NO. 42384

Inoue, Tatsuo

CATALYTIC REMOVAL OF NOX IN GASES. *(Shokubai ni yoru sanka chisso no jokyo). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 51(1):19-24, Jan. 1972.*

A general discussion on the properties and the catalytic removal of nitrogen oxides is presented. The injuries to human body and damages to various equipments caused by nitrogen oxides have been recognized for some time. Nitric oxide reacts with oxygen and forms nitrogen dioxide. The reaction is accelerated by high pressure and small concentrations of ozone. High temperatures and pressures are used in industries for NO removal. Nitric oxide also reacts with activated carbon and ferrous sulfide; these are applied to NO removal in industries. Nitric oxide can be removed effectively by washing with acidic or alkali salts. When sulfides of tungsten and cobalt are used for the high pressure catalytic reduction of NO, 100% conversion is found. High rates of conversion are also obtained with silicon dioxide and alumina, or with alumina alone.

23168 APTIC NO. 42638

Ishihara, K.

FLEXIBLE FILTER ATTACHMENT MECHANISM. *(Kagyosei firuta no toritsuke kozo). Text in Japanese. (Sanyo Electric Appliances Co., Ltd. (Japan)) Japan. Pat. Sho 47-7357. 2p., March 17, 1972. (Appl. May 16, 1965, 1 claim).*

The invention is designed to facilitate the loading and unloading of air filters in the limited space of an air conditioner. The air conditioner has a removable suction grill in front, a precipitation receptacle at the bottom, and the main mechanism below the receptacle partition. At the top is a fan and below the fan is a heat exchanger installed diagonally between two walls of the air conditioner. Two paralleling metal rods are attached vertically to the lower side of the heat exhanger, so that the rods act as railings. A flexible fabric filter, with a weighted stick at one end and hooks at the other end, is attached to the top of the heat exchanger, hooked on to the leveled edge. The stick at the end of the filter fabric rolls down on the metal railings by its own weight and fits into the space. This facilitates the exchange of the air filter in the limited space.

23169 APTIC NO. 42614

Ishii, Kenichi

DUST PASSAGE REGULATING AND ADJUSTMENT DEVICE FOR A DUST RECEPTACLE PARTITION FOR AN AIR CLEANER. *(Kuki seijoki no chiriuke ni okeru shikiri kabe no chiri tsuro no ichi kisei sochi). Text in Japanese. (Tokyo Filtering Appliances Co., Ltd. (Japan)) Japan. Pat. Sho 47-9407. 2p., April 10, 1972. (Appl. Aug. 11, 1969, 1 claim).*

This utility model is designed to prevent the returning of dust particles into the circular passage of a horizontal type air cleaner from the dust bin. An air suction pipe is installed at the upper side of a horizontal air cleaner, opposite the dust collector. On the side directly opposite from the dust collector is an outlet and a baffleboard. The baffleboard has a small filter piece attached to it. The main filter is in the upper side of the cylinder, and between the outer casing of the air cleaner and the filter is a circular air passage through which dust is collected into the dust bin. A partition cuts off the dust bin from the main body of the cleaner, except for the opening at the top. Since this partition is fitted to the stopper at the top, the opening must come at the top. The position of the opening insures the prevention of dust returning to the air passage, since the dust will be accumulated at the bottom of the dust bin.

23170 APTIC NO. 42801

Ishii, Tei and Sataro Sado

IMPROVEMENT ON EXHAUST GAS RECOMBUSTION DEVICE WITH A BURNER. *(Haiki gasu no bana tsuki sainenshoki no kairyo). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-2927. 3p., Jan. 26, 1972. (Appl. July 23, 1969, 1 claim).*

This invention relates to the improvement of a recombustion device for the removal of harmful gases in engine exhausts. The recombustion chamber is a cyclone type in which a gas heating tube, a venturi tube for the supply of air, and a small burner for the exhaust gas combustion are equipped. In order that the combustion can be controlled by the gas temperature in the chamber, a bimetal is used to intermit the electric current and regulate the air valve of the fuel vaporizer. Thus, the recombustion chamber is kept at the exhaust combustion temperature to burn and remove harmful gases despite the running condition of the engine.

23171 APTIC NO. 42651

Ishima, Terukazu

AIR FILTER DUST ELIMINATION DEVICE. *(Ea firuta jojin sochi). Text in Japanese. (Tokyo Shibaura Electric Co., Ltd. (Japan)) Japan. Pat. Sho 47-10076. 2p., April 14, 1972. (Appl Aug. 13, 1970, 1 claim).*

This utility model is designed to simplify the cleaning of an air filter without washing or applying another air cleaner. The device is a casing with openings on the narrow sides of an oblong casing. The openings are joined with butterfly hinges. On the two opposite flat sides of the casing are exhaust ducts which are connected with a vacuum pump. Inside the casing, on both sides of the inserted filter are two protectors, which are fixed at a desired position by adjustable screws. These adjustable screws make it possible to stabilize filters of various thicknesses. A soiled filter is placed in the casing and is stabilized by the screws. The vacuum pump is operated and the air in the casing is sucked out. The suction is evenly distributed over the filter surface by the holes that are evenly opened on the partition between protector and the duct.

23172 APTIC NO. 42617

Ishizutani, Akira, Nobuyuki Togashi, and Tomomi Kikuraku

ELECTRIC IGNITION INTERNAL COMBUSTION ENGINE AIR POLLUTION PREVENTION DEVICE. *(Denki chakka nainer kikan no taiki osen boshi sochi). Text in Japanese. (Honda Technological Research Lab., Wako (Japan)) Japan. Pat. Sho 47-10892. 3p., April 1, 1972. (Appl. April 4, 1968, 1 claim).*

This invention is designed to simply and effectively prevent the sudden decrease of air suction in the engine caused by idling and by sudden decrease of speed. Being an electric device, it also delays the spark timing and lowers the engine power. It is designed so that the negative pressure responder and the throttle valve operator will operate only when the throttle valve is in a near-closed position. The accelerator and the throttle valve operator are connected, with a small space between. When the throttle valve is near the closed position, the operator is stopped by the increase of negative pressure. The valve operator is made so that the throttle valve will open without moving the operator itself, and when the operator is not moving, spark timing is delayed. At other times, spark timing depends on the rotation speed of the engine.

23173 APTIC NO. 42618

Ishizutani, Akira and Shuichi Yamasaki

AIR POLLUTION CONTROL DEVICE FOR INTERNAL COMBUSTION ENGINE. *(Nainen kikan no haiki no taiki osen boshi sochi). Text in Japanese. (Honda Technological Research Lab., Wako (Japan)) Japan. Pat. Sho 47-10897. April 1, 1972. (Appl. April 6, 1968, 1 claim).*

Using the suction negative pressure that is created when the suction valve of an automobile internal combustion engine is closed, and by not closing the valve entirely, and therefore preventing an excessive decrease of the suction air quantity of each cycle, emission of incompletely burned elements is prevented. When an internal combustion engine is rotating at a high speed, throttle wire is loosened to suddenly decrease the speed. By returning the throttle lever by its spring and closing the valve quickly, the suction pressure is drastically increased. The first pressure responder rod moves the diaphragm and stops the throttle lever to close the valve completely to prevent an excessive decrease of suction air. In this invention, the second negative pressure responder with an easy spring is operated lightly, and when the negative pressure increases, the diaphragm immediately operates and moves the rod. The throttle lever rapidly moves downward, moving the diaphragm suddenly downward too, and transfers the pressures in two compartments of the air chambers. By an increase of the internal pressure in one of the chambers, and suction negative pressure application, the throttle valve is never completely closed. This prevention of the sudden and complete closing of the throttle valve is the main feature of the invention.

23174 APTIC NO. 43299

Iversen, Reid E.

AIR POLLUTION CONTROL: ENGINEERING AND COST STUDY OF THE PRIMARY ALUMINUM INDUSTRY. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers, New York, Metallurgical Society, 22p., 1972. 3 refs. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Metallurgical Society, San Francisco, Calif., Feb. 22, 1972.)*

Gaseous and particulate Fluorides are the most serious pollutants emitted from aluminum reduction plants. Other pollutants such as cryolite, aluminum fluoride, calcium fluoride, chiolite, hydrocarbons, and carbon have been identified. The gaseous emissions, in addition to the fluorides, have been identified as carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen oxides, hydrogen sulfide, carbonyl sulfide, carbon disulfide, silicon tetrafluoride, and hydrogen fluoride. The greatest source of pollutants of all types is normally at the individual electric cells or pot lines. The anode bake plant is potentially the second greatest source. Emissions from an uncontrolled pre bake potline have been measured at 92 lb/t Al, total solids, 60 lb/t SO2, and 46 lb/t total F as well as volatilized hydrocarbons. Primary controls collect emissions at the pot head; secondary controls are located in the roof monitor area. About 75% of the plants in the U. S. have primary controls only, 7% have primary and secondary, 15% have secondary controls only, and 3% have no controls. The industry as a whole showed an emission control factor for total F of 73%. This amounts to 12 lb gaseous/t of Al and 19 lb/t for solids. A well designed pre-bake plant with primary and secondary controls could reduce emissions to 1.6 lb/t gaseous and 5 lb/t solids. Annual costs to the industry for control devices are now $58/T for capital and $16/T for operating expenses. Control systems include baffles, spray towers, wet cyclones, packed towers, bubbler towers, venturi scrubbers, mechanical collectors, multicyclones, electrostatic precipitators, bag filters, absorption, and fluidized beds.

23175 APTIC NO. 42451

Jacobs, D. G., C. J. Barton, M. J. Kelly, C. R. Bowman, S. R. Hanna, F. A. Gilford, Jr., and W. M. Culkowski

THEORETICAL EVALUATION OF CONSUMER PRODUCTS FROM PROJECT GASBUGGY FINAL REPORT. PHASE II: HYPOTHETICAL POPULATION EXPOSURES OUTSIDE THE SAN JUAN BASIN. *Oak Ridge National Lab., Tenn., Health Physics Div.; El Paso Natural Gas Co., Tex.; and National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Air Resources Atmospheric Turbulence and Diffusion Lab., Atomic Energy Commission Contract W-7405-eng-26, 24p., Feb. 1972. 34 refs.*

NTIS: ORNL-4748

The dosages are estimated that might be received by individual consumers in west coast metropolitan areas from the hypothetical use of project Gasbuggy gas. Tritium is the radionuclide of most concern. Calculations show that an annual radiation dose of 2.2 to 2.5 millirems might be attained in these areas if gas containing 1 pCi/cu cm of Tritium were used in homes having unvented space heaters. The potential average annual dose to members of the public in the same areas is estimated to be about 0.5 millirem/yr. These doses as well as potential doses resulting from the use of liquid hydrocarbons separated from the gas and from possible use of by-products manufactured with Tritium- contaminated gas fractions, were small when compared with the National Radiation Council s Radiation Protection Guide of 170 millirems/yr and with background radiation levels in the normal human environment.

23176 APTIC NO. 42780

Joseph, James

CLEAN AIR DIESEL CARS? -- A POLLUTION ANSWER? *Diesel Gas Turbine Progr., 38(7):28-29, July 1972.*

In 1971, the U. S. Environmental Protection Agency awarded a Phase I contract for the prototype development of an urban duty small diesel car, the only diesel among three low pollutant clean automobile designs thus far accepted under the new Federal Clean Car Incentive Program (FCCIP). Built on an extensively modified Volkswagen chassis and fitted with an aerodynamic fiberglass body, this first diesel small car is powered by a 60 hp, pre-combustion chambered, 4-cylinder, 4-cycle horizontally opposed, liquid-cooled 119.6 cu in. diesel engine. The CI-196 diesel is perhaps the smallest, lightest weight, and among the highest speed diesel vehicle powerplants yet designed, and one of the few small engines with pre-combustion, rather than direct injection, operation. The engine will work through a four speed transmission, with the radiator and an electric fan located up front ahead of the baggage compartment. A water pump is driven by the same front-end belt that also powers the generator, and a cog belt drives the Colt-Sigma injection pump. The three phases of the FCCIP program are described.

23177 APTIC NO. 43147

Kaiser, E. R. and J. Tolciss

CONTROL OF AIR POLLUTION FROM THE BURNING OF INSULATED COPPER WIRE. *J. Air Pollution Control Assoc., 13(1):5-11, Jan. 1963. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 55th, Chicago, Ill., May 20-24, 1962.*

Nine tests were conducted on a commercial batch-type furnace for burning the insulation off copper wire. The purpose was to investigate the control of air pollution from the process. The black smoke produced in the primary chamber was consumed by the oil-fired afterburner so long as temperature of the gases leaving the afterburner was above 1500 F. Under those conditions, the stack emitted white fumes from the beginning of the burn, finally decreasing in density to a clear stack for 15 to 48% total time. The dust and fume content of the raw stack gases averaged 240 lb/ ton of original wire. The dust was 85% soluble, and was mainly metallic chlorides. A continuous stream of the total flue gas was cleaned by water in a pilot scale Peabody gas scrubber under three sets of conditions. At a total gas pressure drop of 42.7 in water gauge through the scrubber, a dust collection efficiency of 94.5% was obtained. The scrubber water became black and acidic, but free hydrochloric acid was not found in the water. By neutralization of the final scrubber water, the metallic chlorides were converted to hydroxides and precipitated at the rate of 151 lb/ton of wire. An additional 32 lb/ton of wire of insoluble matter, present before neutralization, were also recovered by filtration. The proportionate amount of lime required for neutralization was 69.7 lb, which left 138 lb of calcium chloride in solution in the clarified scrubber water. The final dust content of the scrubbed flue gases was 0.675 lb/1000 lb of flue gas, corrected to 50% excess air or 0.36 grains/standard cu ft. The recovery of byproducts, such as metal hydroxides and calcium chloride, may pay for much of the expense of gas cleaning.

23178 APTIC NO. 42417

Kamino, Yasumi, Shigenori Onitsuka, and Kenji Yasuda

A STUDY ON DESULPHURIZATION OF FLUE GASES BY THE ACTIVE CARBON PROCESS USING STEAM DESORPTION. (PART 1). DESORPTION OF SULPHUR DIOXIDE FROM ACTIVE CARBON. *Bull. Japan Petrol. Inst., 14(1):1-6, May 1972. 4 refs.*

The thermal desorption reaction of sulfur dioxide absorbed chemically on active carbon was investigated using a thermobalance, a pyrolysis apparatus, and a desorption testing apparatus. The desorption rate of SO2 by thermal desorption was affected greatly by the temperature. The desorption reaction began gradually at 200 C and the rate increased rapidly at 300 C. Thermal decomposition of the active carbon itself became noticeable at about 600 C. The main components of the gas generated by the desorption reaction were SO2, carbon dioxide, and water. Carbon dioxide generation increased in proportion to the amount of adsorbed SO2. The molar ratio of CO2:SO2 was fixed by the temperature of desorption regardless of the quantity of SO2 adsorbed and was less than 0.5 when the temperature was under 750 C. The desorption reaction with super-heated steam was a 1.5- order reaction; the energy of activation was 7.98 kcal/mol. The change in form of oxides on the surface of the active carbon must also be considered in the reaction.

23179 APTIC NO. 42631

Kamino, Yasumi, Shigenori Onizuka, Masaaki Miyaji, and Kenshi Yasuda

THE TREATMENT METHOD FOR ACTIVATED CARBON FOR EXHAUST GAS. *(Haigasu shoriyo kasseitan no shori hoho). Text in Japanese. (Hitachi Co., Osaka (Japan)) Japan. Pat. 47-13362. 3p., April 22, 1972. (Appl. June 10, 1967, 1 claim).*

This invention relates to a treatment method for the recovery of activated carbon for flue gas purification. Flue gas containing sulfur dioxide is cooled to 150 C and introduced to an absorbing tower where SO2 is absorbed by activated carbon and purified gas is released from the stack. The activated carbon is then washed with super-heated steam while flue gas for purification is led to another absorbing tower, and the absorbed SO2 is washed and led to a condenser and then to a separator where it is separated from water. Hot air from the heat exchanger is blown into the absorbing tower and the activated carbon is regenerated at a temperature below the ignition point. An experiment was carried out with an absorbing tower 20 cm in diameter and 1 m in height packed with 8 kg of activated carbon for purifying gas containing 1500 ppm SO2. Super-heated steam of 300 C and 100 C air were used. Results show that, after 10 times of repeated regeneration, the activated carbon retains its initial activity.

23180 APTIC NO. 42868

Kamino, Yasumi, Shigenori Onizuka, and Kenji Yasuda

FLUE GAS TREATMENT APPARATUS. *(Endo gasu shori sochi). Text in Japanese. (Hitachi Shipbuilding Co., Osaka (Japan)) Japan. Pat. Sho 46-34961. 3p., Oct. 13, 1971. (Appl. Sept. 16, 1968, 1 claim).*

This invention relates to the removal of sulfur dioxide from stack gas first by adsorption with activated carbon and then washing with super-heated steam. Stack gas from the power plant is introduced into an adsorption tower packed with activated carbon which is discharged from the bottom at a constant rate after it is saturated with SO2. In the desorption tower, superheated steam is applied to the activated carbon, and the SO2 is washed out by the steam. The gas-water vapor mixture is then condensed, and the SO2 is separated from liquid and supplied to sulfuric acid or other manufacturing process. The activated carbon, dropped in the condensed water, is removed from the bottom of the condensing chamber by a belt conveyor and passed to a drying tower where it is reactivated and re-supplied to the adsorption tower.

23181 APTIC NO. 42750

Kane, John M.

OPERATION, APPLICATION AND EFFECTIVENESS OF DUST COLLECTION EQUIPMENT. *Heat. Vent. Ref. Sect., 49(8):87-98, Aug. 1952.*

Dust collection equipment is available in numerous designs using a number of principles, and featuring wide variations in effectiveness, initial cost, operating and maintenance cost, space, arrangement, and materials of construction. Factors which will influence equipment selection include: concentration and particle size of the contaminant; degree of collection required; characteristics of the air or gas stream; characteristics of the contaminant; and methods of removal and disposal of collected materials. High efficiency, high cost collectors include electrostatic precipitators and sonic devices, while high efficiency, moderate cost collectors include the fabric collector group and many wet type designs. Low cost, lower efficiency designs are also described. To fill the need for dust collection from isolated, portable, or frequently relocated dust producing operations, a number of unit collector designs are available having capacities in the range of 200-1000 cfm. Costs, provisions for dust disposal or salvage, equipment location, servicing, maintenance, recirculation of cleaned air, and makeup air supply are discussed.

23182 APTIC NO. 42653

Kaneda, Junichi and Masaji Tsuruoka

AUTOMOBILE AIR POLLUTION CONTROL FUEL TANK. *(Jidosha yo taiki osen boshi nenryo tanku sochi). Text in Japanese. (Honda Technological Research Lab., Wako (Japan)) Japan. Pat. Sho 47-9121. 2p., April 7, 1972. (Appl. Nov. 26, 1968, 1 claim).*

To prevent air pollution by evaporation of fuel, a flexible diaphragm is sometimes installed in the fuel tank and partitions the tank into an air chamber with a breezer hole and a fuel chamber. However, if the tank is filled and the diaphragm comes up all the way to the top of the tank, the tank could be destroyed if the temperature rises and the fuel expands. This utility model eliminates such danger by providing a hollow, flexible ball at the bottom of the fuel tank. When the tank is filled and the air chamber is completely eliminated, the expansion of fuel will be absorbed by the compressable, flexible hollow ball, and the air tight chamber will not explode.

23183 APTIC NO. 43665

Kawanaka, Shoji and Hiroshi Azuma

THE CHEMICO TYPE STACK GAS DESULFURIZATION SYSTEM. *(Chemico shiki haien datsuryu setsubi). Sekiyu to Sekiyu Kagaku (Petrol. Petrochem.), 15(12):48-53, 1970 (?). Translated from Japanese. 20p.*

Stack gas desulfurization based on a magnesium oxide system and on a calcium system is discussed. Three processes were developed for the MgO system stack gas desulfurization equipment so that they could be applied to various stack gas conditions. The MgO slurry process is suitable for the desulfurization of stack gases containing no minute solids. The MgO clear liquor process is applied to desulfurizing and dust-removal of stack gas containing minute solids such as fly ash. The two stage MgO process is also suitable for processing stack gas containing minute solids. Since the MgO slurry process is basic to all three processes, it is described in detail. It consists of five processes, namely, absorption in a venturi scrubber, centrifugation, drying, calcination, and slaking. Two processes have been designed for stack gas desulfurizing equipment using calcium compounds as the absorbent. They are the Chemico-type throw-away process and the gypsum manufacturing process, both of which uses a venturi scrubber. The results of pilot plant testing and cost estimates are also included.

23184 APTIC NO. 43166

Keane, John D., William Wettach, and Wouter Bosch

MINIMUM PAINT FILM THICKNESS FOR ECONOMICAL PROTECTION OF HOT- ROLLED STEEL AGAINST CORROSION. *J. Paint Technol., 41(533):372-382, June 1969. 11 refs. (Presented at the Federation of Societies for Paint Technology, Annual Meeting, 46th, New York, Oct. 25, 1968.)*

A ten-year paint exposure study was conducted to determine if there is a minimum or optimum paint film thickness for the economical protection of hot-rolled steel. In all work to date, each additional mil of paint thickness has been accompanied by an increase of about 20 months in paint life. There was an economic initial paint film thickness above which long-term protection was afforded throughout the entire study period. This minimum effectual thickness, however, was not a constant, being thinner for the more durable and less permeable paints. This thickness tended to be lower in milder environments, and to an unexpectedly limited extent, lower on well-prepared surfaces. It was far more economical to apply sufficiently heavy films at the beginning rather than to undertake more frequent subsequent maintenance painting. The alkyd tended to be slightly more economical than the other five generic systems. Vinyls gave long-term protection, but required white metal blast cleaning to avoid edge failure at the panel supports. At the seacoast, the most expensive surface to protect was one which had been completely rusted at the site, blast cleaned and painted. Intact mill scale showed lowest cost, but cannot be presumed to be commercially available. (Author summary modified)

23185 APTIC NO. 43296

Keyser, N. H. and H. P. Munger

THE FOUNDRYMAN LOOKS AT AIR POLLUTION. *Trans. Am. Foundrymens Soc., vol. 60:364-370, 1952. 15 refs.*

Airborne contaminants from a foundry are classified as dust, fumes, and noxious gases. They originate at many points in the foundry. Particle size is the most important property of solid contaminants. Each foundry finds itself in a different situation because the nature of the operation differs from foundry to foundry and because location of the foundry is of great importance. The foundryman and the local air pollution control authorities should cooperate in working out an individual program for collecting dusts and fumes, employing the knowledge and research methods at hand. The technical methods for controlling air pollution include dry inertial collectors and wet scrubbers which have a wide range of efficiencies and also a wide range of costs. Filtering methods and electrostatic precipitators are among the most efficient dust collectors. In spite of a number of factors which partially offset the cost of air pollution control, cleaning air rarely yields a net profit. The actual cost will depend largely on the amount of cleaning required by the local conditions. The public will eventually pay the cost. (Author abstract modified)

23186 APTIC NO. 43253

Khomutinnikov, P. S. and Yu. M. Dronevich

PROPOSALS FOR GAS-PURIFICATION UNITS. *Stal, no. 7:529-533, July 1960.*

New schemes of gas purification have been adapted to changing conditions of production in blast-furnaces and steelmaking plants. To purify blast-furnace gas at normal pressure, the DM type damp electrofilter is sufficient. This consists of a cylinder with a packed scrubber near the bottom and enlarged upper part with an electrostatic precipitator. In the DM-200 electrostatic filter, the hot gas enters the lower part, passes through a three-tier wood-packed scrubber in the chordal position and then to the electrofilter proper, which consists of precipitation tubes and corona discharge leads. The purification of blast furnace gas at increased pressure has been faced with both stricter requirements and the necessity for reducing pressure losses in the gas purification system. A number of metal processers throttle the gas through scrubber and baffle units but this results in a large amount of wasted energy. A better system has been devised in which the gas is treated in a tubular atomizer between scrubber and electrofilter. This results in coagulation with a small loss of energy and allows an increase in velocity through the electrofilter of 2.5 to 3.5 times. The purification of gases from basic oxygen furnaces is made more difficult by the larger dust concentrations resulting from this process. The use of a dry three-field horizontal electrofilter has achieved interception of 98-99% of the flue dust against a low hydrostatic head. The high cost of the installation is justified by the need to protect the atmosphere from deleterious discharges. A scrubber section, tubular atomizers, and a tubular electrofilter are recommended for installation to replace inefficient equipment now used on oxygen-blown converters. Pilot installation of this system is expected in the near future. The purification of gases from open hearth furnaces is also discussed.

23187 APTIC NO. 42634

Kimura, Hitohiko

AIR FILER. *(Eya firuta). Text in Japanese. (Hoko Engineering Co., Ltd., Okazaki (Japan)) Japan. Pat. Sho 47-7352. 2p., March 17, 1972. (Appl. June 13, 1969, 1 claim).*

The device is designed to facilitate elimination of water condensation from the air filter simply, inexpensively, and without soiling clothes and hands. The air filter is the type in which air enters from the entrance, whirls around the centrifugal chamber, drops water particles and dusts, and goes out from another exit through a filter element. The lower end of the separation chamber has an opening through which a small tube and a stick valve are inserted. The tube and the opening are completely covered with an elastic synthetic rubber sealant. When the stick is raised, the valve opens and accumulated water-containing dust can be discharged. The direction of emission opening can be changed into a desired direction because the material is elastic.

23188 APTIC NO. 42648

Kine, Takeo and Kazutoshi Kawamura

AIR CLEANER. *(Eya kurina seijo sochi). Text in Japanese. (Komatsu Manufacturing Co., Ltd. (Japan)) Japan. Pat. Sho 47-9417. 2p., April 10, 1972. (Appl. June 4, 1970, 1 claim).*

This utility model is designed to facilitate the cleaning of air filters so that the system will not have to be taken apart when cleaning is required. An air motor is fixed on the outer wall of an air filter casing; the rotation of the motor is extended to a crank which conveys the rotation to a rod inserted through the casing and vibrates the filter element. One side of the motor is connected with a compressor with a valve device and the other side is connected with an air suction pipe which is connected with the filter element. The compressed air supplied to the suction pipe goes through the cleaner casing, enters the filter, and leaves. The dusts accumulated on both sides of the filter element are loosened by the vibration and the compressed air.

23189 APTIC NO. 43515

Kistler, Jules

TWO MODERN METHODS FOR ABATING AIR POLLUTION IN FOUNDRIES AND IRON AND STEEL WORKS. *(Zwei moderne Verfahren zur Bekaempfung der Luftverunreinigung in Giessereien sowie in der Eisen- und Stahlindustrie). Text in German. Giesserei (Duesseldorf), 43(13):333-340, June 1956.*

General problems of dust in foundries and iron and steel works as well as two methods of dust separation are described. Fine dusts, particularly when containing crystalline silicic acid, kieselguhr, chalk flint, aluminum, manganese dioxide, Thomas slag, or chromium compounds, are most dangerous since they can cause silicosis. Dust emissions are highest during mold opening and sandblasting. Finest foundry dust contains 2-15%, and courser dust, above 10 micron, 50-75% of silicon. More than 90% of foundry dust is made up of fine fractions. The maximum iron, zinc, and lead contents in dusts lie at 10.0, 15.0, and 0.15 mg/cu m. The dust concentration in foundries lies in a range of 4.4 5.8 mg/cu m, corresponding to 5-7 kg/ton of iron, while the respective value for Siemens-Martin furnaces is 2.75 g/N cu m. Dust problems in foundries can be effectively solved by two different types of equipment. Pease-Anthony venturi scrubbers apply gas flow rates of 60-120 m/sec to agglomerate dust particles with finely dispersed water. Such scrubbers can be also applied to sulfur dioxide and sodium sulfide. The efficiency for open-hearth and blast furnace gases lies at 98-99%. Elex- Schneible type centrifugal wet separators, with low water consumption, can be used for cupola furnaces as well. The water is dispersed by turbine blades to form a curtain of fine droplets. Exhaust hoods installed in foundry facilities are a basic means of abating dust concentrations. The temperature difference between the ambient and the fresh air should not exceed 6 C.

23190 APTIC NO. 42365

Kitagawa, Hiroshi

PREPARATION OF ACTIVE CARBON FROM PHENOL-FORMALDEHYDE RESIN. *(Fenoru jushi o genryo to suru kasseitan no seizo). Text in Japanese. (Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 6:1144-1150, June 1972. 14 refs.*

Phenol-formaldehyde resin was carbonized at 700 C and then activated with steam under fluidized conditions. The experimental conditions were as follows, activation temperature: 920 C; activation time: 2-5 hr; nitrogen flow rate: 5l/min; steam flow rate: 0.7 g H2O/g-char/hr. Specific surface area, pore size distribution, equilibrium adsorption isotherms, and adsorption rate of methylene blue and sodium dodecylbenzene sulfonate (DBS) were measured for each active carbons. More than 90% of the pore volume consisted of pores smaller than 100 A in radius. Values of pore volume smaller than 100 A in radius were 0.379-0.978 ml/g. The values of specific surface area of active carbon increased with decreasing weight and reached 2000 sq m/g at about 75% weight loss. The reactivity of phenol-formaldehyde resin char with steam was lower than that of coal char. Both equilibrium adsorption amount and effective pore diffusivity of methylene blue and DBS increased with activation. For the adsorption of methylene blue and DBS, the ratio of effective pore diffusivity to free diffusivity were of the order of 10 to the negative 7th to 10 to the negative 5th and 10 to the negative 6th to 10 to the negative 4th, respectively. Volume of pores smaller than 100 A in radius appeared to be very important for these adsorbates. Active carbons whose specific surface area were more than 1500 sq m/g showed higher adsorption properties than commercial ones. (Author abstract modified)

23191 APTIC NO. 43360

Kitani, Susumu and Kazuhiro Takahashi

GAS FILTER DEVICE USING SOUNDWAVE VIBRATION. *(Onpa shindo o mochiita kitai rokaho). Text in Japanese. (Japan Inorganic Fiber Industries, Co., Inc.) Japan. Pat. Sho 47-16719. 2p., May 17, 1972. (Appl. March 27, 1969, 1 claim).*

This invention improves the method of filtering dust-containing gas, using an ultra low cycle or audible sound wave vibration. By a sound wave, the dust particles and filtering part are forced to vibrate, and a sympathetic vibration is formed so that a belt of vibrating sound wave will be formed on the filter. By the difference in vibration potentials, the particles and the filter collide with each other and enhance the filtering effect. An iron cylinder with a 100 mm diameter has a speaker at the lower end, an oscillator, and an amplifer. Glassfiber filter is packed inside. A test experiment was conducted by passing an aerosol of 0.3 micron through the cylinder by a suction vacuum pump at the other end, at the speed of 5.4 cm/sec. The gas at the entrance and the exit was measured by a light-scattering spectrometer. When the vibration sound wave belt was created in the filter material, the filtering rate was from 66 to 82% when the vibration count was either 150 or 300 c/sec. At other times, the filtering rate ranged from 18 to 45%. The smaller the dust particle, the more effective vibration was created.

23192 APTIC NO. 43396

Knudson, James C.

AIR POLLUTION CONTROLS TO MEET WASHINGTON STATE KRAFT MILL STANDARDS. *Preprint, Air Pollution Control Assoc., Pacific Northwest International Section, 40p., 1970. 10 refs. (Presented at the Air Pollution Control Association, Pacific Northwest International Section, Annual Meeting, Spokane, Washington, 1970.)*

A 1969 regulation passed by the State Air Pollution Control Board required kraft mills to monitor malodorous and particulate emissions, and to report all monitoring results on a monthly basis. Detailed compliance schedules for controlling air pollution were adopted early in 1970. The companies are required to submit quarterly progress reports concerning their compliance schedules. The programs submitted show that kraft mills in Washington have adopted the following control methods: TRS (total reduced sulfur) standards will be met by the installation of new furnaces and/or black liquor oxidation (weak and strong), and/or by reduced sulfur scrubbing; particulate standards will be met by the installation of new electrostatic precipitators on recovery furnaces, venturi scrubbers on lime kilns, and scrubbers or fan demister combinations on smelt tanks; and the requirement for thermal oxidation of non-condensibles from digesters and evaporators will be met by burning in lime kilns or gas-fired furnaces. As a result of these standards, particulate emissions from kraft pulp mills will be reduced by 60% for the period 1970-1975, while malodorous emissions will be reduced by 90% for the same period. The cost of control is being reduced through the tax incentive law, passed by Washington Legislature in 1967. (Author summary modified)

23193 APTIC NO. 42387

Kobayashi, Hisamine

EXHAUST GAS PURIFICATION METHOD. *(Haiki gasu joka hoho). Text in Japanese. (Shikishima Chipton Co., Ltd. Nagoya (Japan)) Japan. Pat. Sho 47-13564. 3p., April 24, 1972. (Appl. Nov. 29, 1967, 1 claim).*

This invention relates to the purification of harmful gases from internal combustion engines. Hard, porous and inactive solids such as alumina, silica, alumina-silica, silica-alumina, melted aluminum oxide, silicon carbide, zircon, pottery materials, and clay are used individually or combinedly as supporter for catalysts of strong acidic salts of silver, chromium, copper, manganese, iron, or cobalt. The best size of the supporter particles is 3 to 5 mm, and the ratio of catalyst and supporter is 0.3% to 15% by weight. When flue gas is introduced into the purifying cylinder packed with 80% in volume of the catalyst supported by the supporter, the cylinder is rotated by applying external force to cause continuous or intermittent friction between the catalyst, and to remove dirt such as carbon sticking on the surfaces of catalyst and supporter. The apparatus has a high purifying efficiency and long durability.

23194 APTIC NO. 42864

Kobayashi, Toshio and Terunobu Takahashi

DUST COLLECTOR. *(Shujintai). Text in Japanese. (Tokyo Electric Co., (Japan)) Japan. Pat. Sho 47-703. 2p., Jan. 11, 1972. (Appl. Sept. 6, 1 claim).*

A dust collector with a multilayer filter provides a larger dust-collecting volume and better mold for vacuum cleaners. Hard or semi-hard particles of synthetic resins, such as acrylic resin, acrylonitrile-polystyrene resin, and vinyl chloride resin, are packed in such a way that particle size gradually decreases from the end at which air is introduced. Openings between the particles permit ventilation. Spiral sticks in the collector allow the expansion of the inside volume. The dust collector retains its shape and strength due to the use of hard or semi-hard resin. In addition, its cost is low.

23195 APTIC NO. 42771

Koizumi, Michio and Tatsuo Ono

STUDY ON PRETREATING PROCESSES OF RESIDUAL OIL DESULFURIZATION. *(Jushitsuyu suisoka datsuryu no zenshori hoho no kento). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. Electric Power Ind., Rept.), no. 71105:1-26, 1970. 12 refs.*

Thermal cracking and thermal cracking with the pretreating minerals of Khafji atmospheric residual oil were investigated for the pretreatment of hydrodesulfurization with the object of accelerating the reaction rate. From the thermal cracking experiments at temperatures of 400-450 C, feed oil flow rates of 200-600 ml/hr and hydrogen pressure of 40 Kg/sq cm G, optimum reaction conditions were shown when the yield of thermally cracked oil was 20-30%. By combining thermal cracking, the reaction rate increased 1.7-2.9 times. From the thermal cracking experiments with 45 kinds of pretreating minerals at a temperature of 430 C, feed oil flow rate of 16 ml/hr and hydrogen pressure of 40 Kg/sq cm G, five kinds of excellent materials were selected. By combining thermal cracking with the selected pretreating materials to hydrodesulfurization the reaction rate increased 1.8-2.8 times. Thermal cracking should be combined with hydrodesulfurization, because the pretreating mineral did not accelerate the reaction rate as much as thermal cracking did.

23196 APTIC NO. 43635

Kringstad, Knut P., William T. McKean, Jan Libert, Peder J. Kleppe, and Cheu Laishong

ODOR REDUCTION BY IN-DIGESTER OXIDATION OF KRAFT BLACK LIQUOR WITH OXYGEN. *Technical Assoc. of the Pulp and Paper Industry, New York, Tappi Eng. Conf., 26th, Proc. 1971, p. 29-54. 34 refs.*

Laboratory studies showed that sodium sulfide was rapidly oxidized to thiosulfate by the injection of oxygen into the digester at the end of a kraft cook. Two moles of oxygen/mole of sodium sulfide were required to reduce the sodium sulfide content in the black liquor by 90% under the conditions used. The injection of this amount of oxygen also reduced the content of methyl mercaptan in the liquor by more than 99% without increasing the content of dimethyl disulfide. The content of dimethyl sulfide was not influenced to any noticicable degree. The oxygen injection was found not to influence the pulp yield or the strength properties of the pulp. However, the pulp was somewhat easier to beat and had a slightly lower brightness. (Author abstract)

23197 APTIC NO. 43343

Krockta, H. and R. L. Lucas

INFORMATION REQUIRED FOR THE SELECTION AND PERFORMANCE EVALUATION OF WET SCRUBBERS. *J. Air Pollution Control Assoc., 22(6):459-462, June 1972. 14 refs.*

Information required for the selection and performance evaluation of all types of scrubbers installed for the primary purpose of removing particulates from any gas process gas stream is provided. Factors involved in the selection of scrubbers include economic factors, environmental factors, and engineering factors including the particle size, concentration, solubility in scrubbing liquid, chemical reactivity, and corrosiveness and abrasiveness of the dust, fume, mist, or fog to be collected; the temperature, pressure, and humidity of the gas; characteristics of the scrubbing liquid, and design characteristics of the scrubber. Information required for scrubber specifications and information to be provided by the equipment supplier are outlined.

23198 APTIC NO. 42306

Krolewski, H.

PROBLEMS OF INDUSTRIAL COOLING WATERS. THE PRESENT COOLING WATER SITUATION IN THE FEDERAL REPUBLIC OF GERMANY. *(Probleme des industriellen Kuehlwassers. Die gegenwaertige Kuehlwassersituation in der Bundesrepublik). Text in German. Tech. Mitt. (Essen), 65(5):193-200, May 1972. 12 refs. (Presented at the Meeting on Problems of Industrial Cooling Water, Feb. 21, 1972, Essen, West Germany.)*

All power plants must emit waste heat. Energy conversion without heat discharge into the open atmosphere is not feasible. The quantity of artificial heat emitted into the atmosphere is so small that no influence in the macro-climate is observable. Several cooling methods are available for the cooling of waste heat, such as fresh water cooling and cooling by circulating water with wet and dry cooling towers. Fresh water cooling can be used in the interior country of the Federal Republic only to a limited extent. Cooling by water recirculation requires replenishing water for the evaporation losses, which in the future will also be available to a limited extent only. Dry cooling is not ready for practical use yet. In the distant future it will be increasingly used for solving the problem of lack of cooling water because of increasing thermal pollution of the rivers.

23199 APTIC NO. 42302

Kronshorst, B.

THE PROTECTION AGAINST CORROSION OF NON-FERROUS METALS BY POWDER COATING. *(Der Korrosionsschutz von NE-Metallen durch Pulverbeschichtung). Text in German. Metall., 26(6):590-592, June 1972.*

Electrostatic powder coating made its way into all fields of metallurgy. Coating powder on epoxy, polyester, and acrylate resin basis is in use. The polyurethane coating powder is in the developmental stage. A comparison of these coating materials shows that epoxy-powder is superior to all others. The great advantage of powder coating is that no solvents are used which pollute the environment. The use of electrostatic powder coating will further expand.

23200 APTIC NO. 43435

Kubota, K. and W. M. Karner

HOW THE WORLD S FIRST DIRECT DESULFURIZATION UNIT IS WORKING. *Oil Gas Intern., 11(8):54-56,59, Aug. 1971. (Presented at the World Petroleum Congress, Moscow, USSR, June 1971.)*

Idemitsu Kosan Co. Ltd. has successfully operated the first direct RCD desulfurization unit employing the Universal Oil Products Isomax process to remove sulfur from reduced crude. The entire reduced crude desulfurization complex at Idemitsu consists of a steam-naphtha reformer with a design capacity of 35 million cfd of hydrogen, a 40,000 b/d RCD Isomax unit, a 210 ton/day sulfur recovery unit, and a 24 ton/day ammonium sulfate plant. The unit was designed to desulfurize 40,000 b/d of Kuwait reduced crude containing 3.9-4.1% by weight of sulfur. The major product is a 650 F-plus heavy fuel oil containing 1% sulfur. Hydrogen to support the process is supplied by the steam-naphtha hydrogen unit. The hydrogen sulfide produced is converted to elemental sulfur. The fresh feed also contains 0.2 wt% of nitrogen which is converted to ammonia and recovered as ammonium sulfate. Operations, catalysts, and feed quality are discussed.

23201 APTIC NO. 42640

Kurifu, Takashi

DRY DUST COLLECTOR FILTER FABRIC. *(Kanshiki shujin rokafu). Text in Japanese. (Shikishima Canvas Co. (Japan)) Japan. Pat. Sho 47-9409. 3p., April 10, 1972. (Appl. Oct. 6, 1969, 1 claim).*

This utility model is designed to prevent static electricity and the damages incurred by static electric charge in a dust collector. It also facilitates separation of dust from the fabric filter. The fabric is woven mainly by polyesther or other types of synthetic fiber, and short fiber metal wires are woven in the amount of 1%. For every four warps of synthetic thread, one warp is a twine of synthetic threads and short fiber metal wires. The woofs are completely made of similar twines of metal and synthetic. The mixtures of the metal fibers are limited to 1% because wire threads are extremely expensive.

23202 APTIC NO. 42364

Kuronuma, Haruo, Yoichi Ito, and Raisaku Kiyoura

COMPOSITION OF V2O5-K2SO4 CATALYSTS DURING THE OXIDATION OF SULPHUR DIOXIDE. *(Nisanka io sanka hanno ni okeru V2O5-K2SO4 kei shokubai no sosei). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 6:1078-1084, June 1972. 12 refs.*

The composition of vanadium pentoxide-potassium sulfate catalysts during the oxidation of sulfur dioxide, especially in its lower concentrations was studied by means of TGA, DTA, X-ray diffractometry, and chemical analysis to obtain further information on the reaction mechanism. It took several hours for the catalyst to reach the equilibrium composition in the reacting gas. This was considered to be one of the several reasons that the oxidation of SO2 generally required a longer time to reach the steady state. The effects of temperature on the absorbed volume of sulfur trioxide by the catalyst and on the V(5+)/V(5+)+V(4+) ratio were studied in the range between 320 through 520 C. The absorbed SO3 volume and V(5+)/V(5+)+V(4+) ratio changed greatly at the temperature range of 400-450 C, and these changes were correlated with the change in the reaction mechanism which occurred at this temperature range. The catalytic activity, the absorbed volume of SO3, and the V(5+)/V(5+)+V(4+) ratio of the catalyst at working state were plotted against catalyst composition in temperature less than 450 C. These plots had inflection points in the vicinity of K2SO4/V2O5 equals 1. This fact suggests that a catalytic active substance may exist in an equal molecular ratio of K2SO4 and V2O5, and that the mechanism of the SO2 oxidation will be more complicated than the proposed theory that potassium pyrosulfate and vanadyl sulfate were produced from K2SO4 and V2O5. (Author abstract modified)

23203 APTIC NO. 42362

Kurosawa, Keiji

FUTURE VISION OF FLUE GAS DESULFURIZATION. *(Haien datsuryu no miraizo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 8(6):577-564, June 1972.*

Approximately 90% of the liquid fuels consumed in Japan are imported from the Middle East area, where the petroleum contains a high concentration of sulfur. Large quantities of liquified natural gas (LNG) have been imported to fight the sulfur oxide pollution, and the development of desulfurization techniques has been drawing more and more attention. The imports of LNG are restricted by its inconvenience, and desulfurization of heavy oil is found less effective than that of flue gas, which always shows more than a 90% removal rate. Many companies have been working on the development of high efficiency and low cost devices for flue gas desulfurization. The desulfurization of flue gas can be divided into dry type and wet type. The dry type has the advantage of easy diffusion of the flue gas due to its temperature. However, the required amount of activated carbon is large and the operation cost is high. The wet type has the advantages of high efficiency on high sulfur oxides concentration and low operation cost, but the disadvantage of poor flue gas diffusion. Two major flue gas desulfurization methods, the Wellman-Lord method and the MKK caustification-circulation method, are described with flow diagrams.

23204 APTIC NO. 42324

Kuzin, I. A., A. I. Loskutov, V. F. Palfitov, and L. A. Koemets

STUDYING THE EFFECT OF THE CHEMICAL NATURE OF ACTIVE CHARCOALS ON WATER VAPOR, CARBON DIOXIDE, AND AMMONIA SORPTION PROCESSES. *(Issledovaniye vliyaniya khimicheskoy prirody poverkhnosti aktivnykh ugley na sorptsiyu parov vody, dvuokisi ugleroda i ammiaka). Text in Russian. Zh. Prikl. Khim., 45(4):760-765, 1972. 14 refs.*

The effect of the chemical nature of active charcoals modified with oxygen, nitrogen, chlorine, and phosphorus on water vapor, carbon dioxide, and ammonia sorption processes was studied. The chemical modification of the charcoal surface resulted in a shift in the volume ratio of micropores to larger pores, while the nature of the micropores volume distribution was not affected. Investigations of water vapor adsorption processes on active charcoals modified with chlorine, nitrogen, and phosphorus revealed the considerable effect of the altered chemical nature of the charcoal surface on the sorption isothermes. The number of the primary adsorption centers per atom of the modifying element decreased from chlorine to oxygen to nitrogen to phosphorus. Oxygen and phosphorus were the best modifiers for the adsorption of ammonia, while the effect of the modification on the adsorption of carbon dioxide, having no dipole moment and negligible polarization, was not considerable. The chemical modification of the charcoal surface permits the adsorption capacity for vapors and gases with considerable dipole moment to be controlled in wide ranges.

23205 APTIC NO. 42331

La Force, Robert C.

COMBUSTION ENGINE POLLUTION CONTROL. *(Assignee not given.) U. S. Pat. 3,656,303. 6p., April 18, 1972. 7 refs. (Appl. April 13, 1970, 12 claims).*

An improved apparatus was devised for maintaining the temperature of internal combustion engine exhaust gases in the chamber of a vessel or exhaust manifold within a requisite range, as well as for their introduction into a thermal reaction chamber by a venturi. The venturi is sensitive to the velocity of the flow of exhaust gases from the manifold and is used to proportionately control the drawing-in of ambient air to cool the manifold and to supply the reaction chamber with reacting oxygen. The air thus drawn-in is first used to cool the manifold and its gas content, and is then flowed within a jacket spacing or chamber about and along the reaction chamber to the discharge or downstream end. Then it is flowed backward along a return pipe from a downstream towards an upstream end of the reaction chamber, and is finally introduced into the venturi. The purpose is to simplify the device required and to maximize conversion of the carbon and hydrocarbons into innocuous compounds while eliminating, or at least minimizing, the further formation of nitrogen oxides.

23206 APTIC NO. 42817

Leikkanen, Henry E. and E. W. Beckman

THE EFFECT OF LEADED AND UNLEADED GASOLINES ON EXHAUST EMISSIONS AS INFLUENCED BY COMBUSTION CHAMBER DEPOSITS. *(CRC Project CAPE-3-68). Preprint, Society of Automotive Engineers, Inc., New York, 28p., 1971. 7 refs. (Presented at the Society of Automotive Engineers National Combined Fuels and Lubricants, Powerplant and Truck Meetings, St. Louis, Mo., Oct. 26-29, 1971, Paper 710843.)*

To assess how lead antiknock compounds in gasolines influence combustion chamber deposits and exhaust emission levels, an intensive state-of-the-art review was made, and data submitted by 18 different companies were analyzed. These studies ranged in scope from single-cylinder engine investigations to a 122-car consumer test program. Based on this review, it was concluded that cars operated on leaded gasolines have higher equilibrium hydrocarbon emissions than those operated on unleaded gasolines, and that mileage accumulation conditions exert a major influence on the magnitude of the hydrocarbon net lead effect. The combustion chamber deposit effect under consumer-type driving conditions is about 7% and under rapid mileage accumulation conditions it is about 20%. The presence of lead in gasoline has no effect on carbon monoxide emission levels. (Author abstract modified)

23207 APTIC NO. 43199

Leisen, P. J.

BUICK FOUNDRY S DUST COLLECTORS BUILD DUNES UNDER WATER. *Plant, vol. 8:36-38, July 1953.*

Inside Buick s new foundry the well-designed hoods at critical dust and fume points are about the only visible evidence -- other than the lack of dust -- that an efficient collecting system is at work. Duct work, for the most part, is hidden in an overhead labyrinth of conveyors and structural framing members. Fans to pull the contaminated air through the ducts and collectors are mounted just below the roof. Water and dust flow from the bottoms of the collectors into an open sluice suspended from the ceiling. The dewatering tanks and fan operation are described. Thirty five multiple-wash collectors remove dirt and dust from the cleaning room, core room, cupolas, sprue mills, and knockout benches. Approximately 250 cu yd of sand is sluiced to the dewatering tanks every day from the collectors and knockout conveyors.

23208 APTIC NO. 42305

Lenz, Hans Peter

COMPARISON BETWEEN CARBURETOR AND INJECTION OTTO ENGINES. *(Vergleich zwischen Vergaser- und Einspritz-Ottomotoren). Text in German. Automobiltech. Z. (Stuttgart), 74(6):249-253, June 1972. 19 refs. (Presented at the Technische Akademie Wuppertal, Seminar Gemischbildung, Verbrennung, und Abgasprobleme bei Fahrzeug-Diesel- und Ottomotoren, Wuppertal, West Germany, Oct. 28-29, 1971.)*

The fuel air mixture preparation can be divided into the following steps: dosing, mixing, mixture transport, and distribution performance. A comparison of carburetor versus injection Otto engines along these steps leads to the conclusion that the injection is superior to the carburetor as far as mixture preparation and mixture distribution during full-load- operation is concerned. Carburetor systems are less sophisticated and permit better dosing. For practical use the costs of injection systems are too high. An exhaust gas decontamination can be achieved by both systems to the same extent.

23209 APTIC NO. 43513

Litonski, B.

ARCHITECTURAL PROBLEMS OF CLEAN AIR MAINTENANCE. *(Architekt und Luftreinhaltung). Text in German. Zentralbl. Industriebau, 16(12):529-537, 1970. 1 ref.*

Problems of air pollution control to be considered when siting and designing industrial plants are reviewed. Basic industry generated air pollutants and the effect of different meteorological conditions on the dispersion of pollutants from point sources are described. Organizational, technical, and architectural measures in air pollution control are described. New processes should be developed and existing ones should be improved to abate pollution, and the maximum possible use of waste products should be emphasized. Different air pollution control techniques such as separation, absorption, adsorption, chemical decomposition, and destruction are reviewed. While stacks should be high, high stacks alone are not sufficient. High flow rates at the discharge end of stacks should be provided, and stacks should be sited with regard to the prevailing meteorological conditions, especially to the dominant wind direction. Rain shields, preventing emissions from being discharged vertically, should be abandoned. Plant premises should be divided into clean and polluted zones, and fresh air intakes should be located in the former. Buildings should be perpendicular to the dominant wind direction, and high buildings should be located in the middle of the plant premises.

23210 APTIC NO. 42752

Little, A.

PRACTICAL ASPECTS OF ELECTROSTATIC PRECIPITATOR OPERATION-- EXPERIMENTS ON A PILOT PLANT. *Trans. Inst. Chem. Engrs. (London), vol. 34:259-268, 1956. 5 refs. (Presented at the Institution of Chemical Engineers, Midlands Branch Meeting, Birmingham, England, Feb. 4, 1956.)*

The dust collecting efficiency of a pilot precipitator treating flue gas from a large pulverized fuel fired boiler was measured for various conditions of operation, including various gas velocities, rapping cycles, and current densities. Collection efficiency is related to the gas velocity by an exponential law, but the variation of efficiency with precipitator length can only be calculated by minor extrapolations of actual performance data relating to that part of the precipitator where the efficiency/ unit length is relatively constant. There is a marked increase in efficiency with high current density and potential. Application of the results to two probable full scale designs shows how continuous rapping is inferior to cyclic rapping at the appropriate interval. The results show that as much as one-third of the emission from continuously rapped precipitators may have been dislodged from the plates and, emerging in an aggregated state, may add substantially to the local deposition of dust. The variation of collection efficiency with particle size is shown for cyclic operation of the precipitator, the small particles being collected slightly less efficiently than the large particles, at least in the size range from zero to 20 micron. (Author summary modified)

23211 APTIC NO. 42458

Lobos, J. S., J. P. McGeer, and D. P. Sanderson

REACTIVITY OF ALUMINA TOWARDS HYDROGEN FLUORIDE. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers (AIME), New York, N. Y., 10p., 1971. 2 refs. (Presented at the American Inst. of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, New York, Feb. 26-March 4, 1971.)*

A simple method was developed to measure reactivity of alumina toward hydrogen fluoride. The apparatus consisted of a heated alumina desiccator. A platinum dish containing a known volume of HF solution was placed in the lower compartment and the desiccator was allowed to heat to a desired temperature. Weighed samples of the alumina in 40 ml platinum crucibles were then placed in the upper compartment. After a known length of time the samples were removed, put in an ordinary desiccator and after cooling analyzed for fluoride. Alpha-type alumina was about 10 times less reactive than the gamma-type. In plant tests using various dry scrubbing systems for pot gases, the gamma-type alumina absorbed over 2% fluorine in a fraction of a second. Other relationships between absorption of fluorine and alumina properties such as degree of calcination and reactivity towards water were investigated. Preliminary operation of a two-stage cell gas scrubbing system with a cyclone incorporated demonstrated flexibility and a number of other benefits, including segregation of impurities such as iron and phosphorus and economic tar fume handling.

23212 APTIC NO. 42327

Lowicki, N. and K. Husmann

THE GRILLO AGS METHOD FOR THE DESULFURIZATION OF FLUE GASES. *(Das Grillo-AGS-Verfahren zur Entschwefelung von Rauchgasen). Text in German. Preprint, 25p., 1971. (Presented at the Technische Moeglichkeiten zur Entschwefelung von Brennstoffen und Abgasen, Essen, West Germany, Nov. 11, 1971.)*

The principle of the Grillo AGS method for flue gas desulfurization is described. The absorption is made in large-capacity absorbers with low resistance into which an aqueous solution of an absorbent is sprayed, while the regeneration of the sulfur dioxide is best performed in large-capacity central facilities by thermal reduction in fluidized-bed furnaces with a low-ash fuel such as heavy oil or natural gas as the energy source. Also elementary sulfur can be added to the fuel to increase the SO2 concentration of the roast gas. The SO2 can be converted into sulfuric acid or elementary sulfur. The energy expenditure for the regeneration is 1.18-1.37 million kcal/ton. The absorbent is made of mixtures of magnesium sulfate and manganese dioxide or magnesium and manganese sulfates with coal additon which undergo reactions at 1000 C to form magnesium-manganite. The aqueous suspension of the latter has very high absorption capability for both SO2 and sulfur trioxide as well as for fluorine. With a necessary reaction time of 0.03 sec, the absorption capability lies at 21-24.5% of sulfur, related to dry mass. The economy of the whole process is largely determined by the capacity of the regenerating plant. The break-even point is reached at a yearly capacity of 165,000 ton of sulfuric acid only.

23213 APTIC NO. 42358

Lowicki, Norbert and Klaus Husmann

GRILLO-AGS PROCESS FOR DESULPHURIZATION OF SMOKE AND WASTE GASES. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 839-842. (Dec. 6-18, Paper EN 29C.)*

The GRILLO-AGS-process is a wet process for the desulfurization of flue and other industrial waste gases. It is a chemisorption process which uses a watery suspension of absorption mass as reagent, based on hydrated oxide compounds of magnesium oxide and manganese dioxide. This process an be used for solving many problems of waste gas desulfurization. Besides removal of sulfur compounds from gases of power stations, it is possible to desulfurize waste gases from iron ore sintering or iron ore pelletizing plants as well as flue gases from metallurgical furnaces. Dust of flue gases from metallurgical processes as well as dust of flue gases from coal fired power stations has to be precipitated first. Electrostatic filters or preferably wet scrubbers are suitable for this purpose. A desulfurization efficiency of more than 90% can be guaranteed. Some actual data and specific costs are also given.

23214 APTIC NO. 43145

Magnuson, Malcolm O. and Wilbert T. Malenka

UTILIZATION OF FLY ASH FOR REMOTE FILLING OF MINE VOIDS. *Bureau of Mines Information Circ. 8488, 1970:83-96, 1970. 2 refs. (Presented at the Ash Utilization Symposium, 2nd, Pittsburgh, Pa., March 10-11, 1970.)*

Abandoned coal mine fires can be controlled and surface subsidence over abandoned mines can be minimized by the use of fly ash to fill the voids left behind by underground mining. The fly ash is introduced dry or in a water slurry through boreholes drilled from the surface into the mined area. Fly ash injection has been used in several field operations and has been demonstrated at the Bureau of Mines Experimental Coal Mine. Bureau experiments showed that dry fly ash was the most suitable of the materials evaluated for remote filling because of its low angle of repose (8 degrees) and its good flow characteristics in pipes and passageways. The fly ash can be injected at a high flow rate without special nozzles or elaborate equipment. It fills open or rubble-filled voids and will harden without shrinking if moisture is present.

23215 APTIC NO. 43254

Martens, D. C., M. G. Schnappinger, Jr., J. W. Doran, and F. R. Mulford

FLY ASH AS A FERTILIZER. *Bureau of Mines Information Circ., no. 8488:310-326, 1970. 26 refs. (Presented at the Ash Utilization Symposium, 2nd, Pittsburgh, Pa., March 10-11, 1970.)*

Analyses show that fly ash contains most of the essential nutrients necessary for successful plant growth. Because of the toxicity of aluminum, boron, and manganese, and the possibility of phosphorus depletion, the determination of the correct level of application is essential. Change in pH should be expected with the use of alkaline fly ash. Samples of fly ash from 15 power plants ranged widely in content of total boron, copper, manganese, molybdenum, zinc, calcium, potassium, magnesium, and phosphorus; thirteen of the samples were alkaline. Three samples increased the B uptake in alfalfa at rates similar to those derived from commercial compounds. The use of fly ash in conjunction with potassium chloride increased the uptake of K in corn. Alfalfa yield was also increased by the application of fly ash containing soluble Mo; the increased pH probably retarded Al and Mn toxicity. Zinc deficiency in corn has been alleviated. The zinc supplying power of the fly ash was equivalent to that of zinc sulfate. Analyses of the bulk composition of the soil, and the fly ash as well as the probable pH change must be determined before use.

23216 APTIC NO. 43287

Matejski, R., I. P. Mukhlenov, and E. Y. Tarat

OPERATION EFFICIENCY OF TRICKLE FOAM APPARATUS SIEVE PLATES OF A NEW TYPE. *(Skutecznosc dzialania przeciekowych aparatow z polkami otworowymi i szczelinowymi nowego typu). Air Conserv. (English translation from the Polish of: Ochrona Powietrza, 4(15):43-55, 1970. 13 refs.*

NTIS: TT 70-55124/1

A study of the hydrodynamics of the dust collection process in foam apparatus with confusor perforation has been generalized using dimensionless equations to define the collection efficiency of these new type plates. The study concentrated on the effect of sieve plates with hole or slot perforation angles from 0 to 30 degrees. The angle is related to foam building efficiency in dust collectors. The optimum angle at gas velocities from 1.5 to 3.0 m/sec and liquid rates of 0.8 to 1.4 cu m/ sq m/hr is 20 degrees for circular perforations and 15 degrees for slots. The capabilities of these new plates qualify them fully for wide use on a commercial scale in foam apparatus as absorbers of readily soluble gases, as highly efficient dust collectors, heaters or coolers of liquids or gases, and in gas wetting or drying operations. (Author conclusions modified)

23217 APTIC NO. 42359

Matsuoka, Yasuyuki

ODOR CONTROL EQUIPMENT OF VENTILATIVE GAS FROM CRUDE OIL TANK. *(Genyu tanku hiagasu boshu setsubi ni tsuite). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 24(6):27-30, June 1972. 6 refs.*

Major methods for odor control and the method using a newly developed catalyst are described. The absorption method using sodium hydroxide as the absorbent has the advantages of fast sulfur dioxide removal and easy recovery of the absorbent. However, it has little effect on the absorption of mercaptans. A new sweeting catalyst called Pazpor-27 is added to the absorbent and used for the deodorization of gas from the crude oil tank. The hydrogen sulfide content of the gas usually ranges from 80 to 1500 ppm, and mercaptan content from 60 to 150 ppm. The new process consists of two reactors, in the first reactor, H2S is removed by a 30 degree beryllium-sodium hydroxide solution, and in the second reactor, mercaptans are converted into bisulfide by 30 degree Be-NaOH containing 200 ppm of Pazpor-27 and removed. Results show that the H2S content is decreased to zero and mercaptan content to 0 to 10 ppm. Approximately $100,000 is invested for the development.

23218 *APTIC NO. 42655*

Matsushima, Hideo

FLEXIBLE DRY GAS FILTER. (Asshuku kano na kanshiki gasu firuta). Text in Japanese. (Japan Atomic Power Research Inst.) Japan. Pat. Sho 47-10077. 3p., April 14, 1972. (Appl. Aug. 19, 1970, 1 claim).

This is a dry-type gas filter for gases containing radioactive dusts and is designed to facilitate compacting the bulky filter to a minimum size for convenient disposal. The filter is composed of an alternate arrangement of filter papers and corrugated aluminum foils. The layers are covered boards at the front and back and are held by bolts and screw handles. The sides of the layers are covered by films with accordion pleats, and the entire layer is held by springs which are held by the bolts. When the filter is disposed, the entire filter is first inserted into a polyvinyl chloride bag, and through the bag from outside, the handles on the bolts are released. The springs pull all the layers together and the accordion pleats fold them into a compact shape.

23219 APTIC NO. 42942

Matthews, C. W.

CHEMICAL BINDERS: ONE SOLUTION TO DUST SUPPRESSION. *Rock Prod., vol. 69:109-112, Jan. 1966.*

There are two basic approaches to the elimination of dust in handling and storing material that contains very fine particles. The most commonly used is a dust control system that works for the suppression of dust through the receiving, crushing, conveying, and stockpiling operations. The other employs a chemical spray that binds together the uppermost particles and forms a protecting crust on the surface of the stockpile. A modification uses a paving material to form an impervious coating on the surface of the pile. Spray systems contain four elements, which are varied to suit the unique requirements of each specific dust control problem: the chemical compound or surface active agent; proportioning equipment to mix the agent with water in the proper proportions; a distribution system to deliver the solution to the points of application; and actuating controls to automatically control application of the chemical solution to the flow of material. In the second approach to the problem of dust control, the chemical coats the topmost particles with a thin film, causing them to adhere to one another. The surface crust that forms is tough, durable, and highly resistant to the action of wind and rain. Two chemicals available for this application are Compound SP and Coherex. Costs for the two approaches are indicated. In many cases it may be possible to adequately protect stockpiles simply by giving due consideration to the properties of the material.

23220 APTIC NO. 43366

Mayuzumi, Takao

AIR FILTER. *(Ea firuta). Text in Japanese. (Sanyo Electric Appliances, Co., Ltd. (Japan)) Japan. Pat. Sho 47-9416. 2p., April 10, 1972. (Appl. May 27, 1970, 1 claim).*

The purpose of this utility model is the development of a sturdy and inexpensive filter material for a dehumidifier. A filter made of metal, such as steelwool or punch metal, is held in front of the dehumidifier by a strong, spring-type frame holder made of inexpensive rigid polyvinyl chloride. This holder snaps onto both the dehumidifier and the filter, holding both firmly, and the exchange of the air filter is very easy.

23221 APTIC NO. 43686

McCann, C. R., J. J. Demeter, J. Dzubay, and D. Bienstock

NOX EMISSIONS FROM TWO-STAGE COMBUSTION OF PULVERIZED COAL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1972. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972.)*

A furnace designed to simulate the performance of an industrial steam generator was modified to accommodate two-stage combustion. The investigation of two-stage combustion included the effects of variations of air distribution between stages. Combustion air to the first stage was 95-105% of stoichiometric, while air to the second stage was sufficient to provide a total air supply ranging from 110-120% of stoichiometric. With 95% of stoichiometric to the first stage and an overall excess air of 20%, 330 ppm of nitrogen oxides in the effluent was obtained. At an overall excess of 11%, 260 ppm of NOx, equivalent to 0.33 lb nitrogen dioxide/1,000,000 Btu, at a carbon combustion efficiency of greater than 98% was obtained. With single-stage combustion in the same furnace, NOx concentrations were about 570 ppm at 20% excess air. (Author abstract modified)

23222 APTIC NO. 42345

McILvaine, Robert L. and Roger E. Kent

GAS SCRUBBER. *(National Dust Collector Corp., Skokie, Ill.) U. S. Pat. 3,656,279. 6p., April 18, 1972. 5 refs. (Appl. April 17, 1970, 13 claims).*

A gas scrubber is described which comprises a housing having an inlet and an outlet for gases as well as a grid structure for introducing the contaminant collecting scrubbing liquid into the gas flow. The grid structure comprises several V-shaped, liquid troughs in a spaced parallel arrangement, with deflector vanes parallel above the troughs, and means for maintaining a relatively constant level of liquid in the troughs for distribution into the high velocity gas flow. A mechanical separator is provided for removing contaminated scrubbing liquid from the gas after contaminants have agglomerated in the liquid from the gas. (Author abstract modified)

23223 APTIC NO. 42332

McLendon, Hoyt B.

WET SCRUBBER TANK. *(Assignee not given.) U. S. Pat. 3,653,186. 7p., April 4, 1972. 11 refs. (Appl. Feb. 24, 1970, 15 claims).*

A wet scrubber system is disclosed, wherein the outer metal tank of the scrubber is protected from pitting and corrosion by providing an air gap between the tank and the acid resistant inner liner. A washing solution is cascaded in the space between the tank and liner along with a counter flow of oxygen-containing gas to wash and passify the metal surface. In the high energy wet scrubber, the particulate matter entrained in the effluent flue gas is removed by high velocity impingement on a series of apertured baffle plates. (Author abstract modified)

23224 APTIC NO. 42381

McRae, Wayne A.

PROCESSES FOR CONTROLLING THE PH OF A SULFUR DIOXIDE SCRUBBING SYSTEM. *(Ionics, Inc., Watertown, Mass.) U. S. Pat. 3,654,103. 10p., April 4, 1972. 2 refs. (Appl. Aug. 3, 1970, 10 claims).*

Apparatus and processes are described for the removal of an acidic gas such as nitric oxide, nitrogen dioxide, nitrogen tetroxide, and/or sulfur dioxide from a gaseous mixture. In particular, the pH of aqueous solutions employed in an electrolytic scrubbing system is controlled to prevent excessive acid build-up. Easily oxidized agents are used for the purpose of removing nitrogen oxides and/or other oxidants from the scrubber system, thereby reducing or preventing the oxidation of sulfur dioxide. Electrolytically produced reducing agents such as sodium dithionite are added to the absorbing solution to control the pH and to absorb the nitrogen oxides. The reducing agent consumed may be reformed by electrolytically reducing bisulfite and/or sulfur dioxide in the cathode compartment of an electrolytic cell with the resulting reformed reducing agent recycled for additional oxidant removal. The pH of the system is controlled by adding lime and soda ash equivalent to the amount of sulfur dioxide oxidized or by crystallizing sulfate salts out of part of the anolyte bisulfate effluent from the electrolytic cells, thereby removing and recovering sulfuric acid from the system. (Author abstract modified)

23225 APTIC NO. 42832

Mezaki, R. and B. Kadlec

REMARKS ON THE REDUCTION-OXIDATION MECHANISM OF SULFUR DIOXIDE OXIDATION ON VANADIUM CATALYST. *J. Catalysis, 25(3):454-459, June 1972. 12 refs.*

A reduction-oxidation mechanism for the catalytic oxidation of sulfur dioxide on a potassium-vanadium oxide catalyst is reviewed. Mars-Maessen-type rate models were examined for their adequacies by using rate data which were collected with two different vanadium oxide catalysts. The use of initial reaction rates appeared to provide definitive conclusions regarding the discrimination of the rate models. One model was adequate for the oxidation reaction under the following experimental conditions: 380-520 C reaction temperature and gas containing to about 10% sulfur dioxide and 11% oxygen. For region outside these experimental conditions more data are needed to discuss the adequacy of the model. (Author conclusions modified)

23226 APTIC NO. 42722

Militello, Vincent A.

RECOVERY OF SO2 VALUES FROM STACK GASES. MAGNESIUM BASED SYSTEM. *Preprint, American Inst. of Chemical Engineers, New York, 14p., 1972. (Presented at the American Institute of Chemical Engineers, North Central Regional Meeting, Cleveland, Ohio, April 28, 1972.)*

A wet scrubbing concept which utilizes magnesium oxide technology to remove and recover sulfur dioxide values from stack gases is described. The process is discussed as it is installed at a 150 MW Mystic No. 6 Boston power station. The flue gas containing SO2 enters the venturi scrubber and contacts the absorbing liquor, a slurry of magnesium sulfite, magnesium sulfate, and magnesium oxide. The SO2 gas diffuses into the surface of droplets and chemically reacts with the MgO forming hydrated magnesium sulfites. The flue gas and entrained liquor leaving the throat enter the separator portion of the absorber through a central downcomer. The liquor falls to the lower section of the separator which serves as an integral storage reservoir while the gas containing less than 150 ppm SO2 passes upward through baffle-type mist eliminators and is exhausted through the stack. The centrifuge system, the dryer system, the MgO system, and the calcination step are described, as well as economic criteria.

23227 APTIC NO. 43311

Mitchell, E., M. Alperstein, J. M. Cobb, and C. H. Faist

A STRATIFIED CHARGE MULTIFUEL MILITARY ENGINE - A PROGRESS REPORT. *Preprint, Society of Automotive Engineers, Inc., New York, 9p., 1972. 6 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1972, Paper 720051.)*

The term stratified charge is generally accepted as describing a spark-ignition, internal combustion engine in which the mixture in the zone of the spark plug is very much richer than the main body of the combustion space. This suggests the elimination of inlet air throttling and the attendant use of lean overall fuel-air mixtures for part load. The system may be thought of as a cross between the homogeneous charge, spark-ignition gasoline engine, and the heterogeneous charge, compression-ignition diesel engine. A progress report on the conversion of the military L-141 gasoline engine to the Texaco Controlled-Combustion System and an evaluation of naturally aspirated and turbocharged installations in an M-151 vehicle are presented. This combustion system involves a coordination of air swirl, fuel injection, and positive ignition. Relative to the standard gasoline vehicle, significant improvement in fuel economy with low exhaust emission levels were demonstrated as were the multifuel capabilities and excellent cold starting facility of the combustion concept. Possibilities for further improvement in the Texaco Controlled-Combustion System exhaust quality through adjustment of operating parameters and add-on devices are also presented.

23228 APTIC NO. 43658

Miura, K. and C. W. Selvidge

KASHIMA OIL COMPLETES FIRST RUNS WITH WORLD S LARGEST DESULFURIZER. *Oil Gas Intern., 11(8):60-62, Aug. 1971. 3 refs.*

The Kashima Oil Co. RDC Isomax Unit can process 45,000 b/d of Kuwait atmospheric reduced crude to produce a desulfurized product whose heavy oil fraction contains 1.0 wt% sulfur. Atmospheric reduced crude, after exchange, combines with recycle gas and passes through the charge heaters. The temperature-controlled charge flows to the RCD Isomax reactors which have proprietary internal design to give good distribution in the two phase reaction system. The reactor effluent flows to heat exchange and vapor-liquid separators to separate enriched recycle vapor and the total liquid product. This vapor flows to the recycle compressors and the liquid passes to the product fractionator. The product fractionator produces a naphtha and a kerosene cut, while the fractionator bottoms go to heavy fuel oil. Make-up hydrogen to supply chemical consumption and solution losses enters the system from the booster compressor discharge on pressure control. The complex also includes a hydrogen plant to provide the system hydrogen requirements and a sulfur plant to convert the hydrogen sulfide product to sulfur. The catalyst for the RCD Isomax process must meet considerably more demanding criteria than distillate hydrodesulfurization catalysts. Construction, shutdowns, and catalyst change are considered for the Kashima unit.

23229 APTIC NO. 42619

Miya, Masami and Masazumi Abe

CONTINUOUS DUST DISCHARGE DEVICE FOR DUST COLLECTORS. *(Jojinki no chiri jido renzoku haishutsu sochi). Text in Japanese. (Ishikawajima Harima Heavy Industries, Co., Ltd. (Japan)) Japan. Pat. Sho 47-10431. 8p., March 28, 1972. (Appl. Nov. 22, 1969, 1 claim).*

Seventy-five percent of dust in the waste material from a blast furnace is eliminated in a settling chamber and the collected dust is taken to a treatment plant where iron is retrieved. This device facilitates a continuous discharge of dust from the dust eliminator to be transported to the treatment plant. The feature of this invention is the funnel shaped screw feeder which is attached to the dust eliminator and forces its content into a hopper. Seal valves are installed at the entrance and exit of the hopper. When eliminating dust from the hopper, the seal valve from the screw feeder is closed. The purge valve and depressurizing valve are opened and nitrogen gas is supplied from a tank. The furnace gas is discharged through the depressurizing valve and pipe, thus equalizing the pressure in the hopper chamber with the atmosphere outside. The dust is discharged by a vibration feeder which is operated magnetically. The dust is emitted on the vehicle by a belt conveyor and is carried to a treatment plant. Dust prevention covers may be used for this operation. When the dust is discharged completely from the hopper chamber, the seal valve is closed and the vibration feeder is stopped.

23230 APTIC NO. 42657

Miyaji, Teruji

AIR CLEANING DEVICE. *(Kuki seijo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-9411. 2p., April 10, 1972. (Appl. Nov. 4, 1969, 1 claim).*

This utility model is a cylindrical air cleaner with four air entrances on the lower wall, and four emission pipes at the top. Inside the cylinder are various layers of filters made of, from the lowest level, small mesh wire screens, a spongy material like urethane foam, activated carbon, and an air flow adjuster with relatively large pores. At the top is a fan operated by a motor creating a suction. At the very bottom is an opening for removal of precipitated dust sedimentation. Large dusts, small particulates, and toxic gases and odors will all be eliminated while going through the various layers, and fresh air will be emitted at the top.

23231 APTIC NO. 42770

Mizuochi, H. and Y. Hasegawa

CATALITIC STEAM DESULFURIZATION OF HEAVY FUEL OIL. *(Suijoki ni yoru jushitsuyo no datsuryo). Text in Japanese. Denryoku Chuo Kenkyush Gijutso Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. Electric Power Ind., Rept.), no.71105:1-17, 1970. 12 refs.*

To examine the effect of steam on the desulfurization of heavy fuel oil, thiophen, khafji crude oil (sulfur content 2.9 wt %), khafji vacuum gas oil (sulfur content 2.2 wt %) and khafji atmospheric residuum (sulfur content 4.3 wt %) were desulfurized with steam using a flow method through a catalyst fixed bed under a steam pressure of 80 kg/sq cm G. Desulfurization efficiency of thiophen was about 45% and 90% at temperatures of 450 C and 500 C. Desulfurization efficiencies of crude oil and vacuum gas oil were both about 40% at a temperature of 450 C. Desulfurization efficiency of atmospheric residuum was about 15% at a temperature of 450 C. The highest desulfurization activity was obtained from a molybdenum-cobalt alumina catalyst. (Author summary modified)

23232 APTIC NO. 42936

Monaghan, M. T. and I. A. McGrath

THE INFLUENCE OF FLUE GAS RECIRCULATION ON THE COMBUSTION OF FUEL OIL. *J. Inst. Petrol. (London), 55(545):302-321, Sept. 1969.*

Trials have shown that recycling approximately one-third of the flue gases to the combustion zone of a fuel oil flame, with an air/gas mixture temperature of 150 C, lengthened the flame and greatly reduced its luminosity. Combustion intensity was reduced by about 40% and the heat transferred was approximately 40% less in the test furnace, which relied primarily on radiant heat transfer. The distribution of heat transfer was more uniform along the length of the furnace. Two levels of recirculation at 150 C were investigated, 33 and 28%. The reduction in flame luminosity and the more even distribution of heat transfer achieved at 33% are probably sufficient for all practical applications. The concentration of solids and the Shell Smoke Number of exit gases were virtually unaffected by recirculation with the fuel oil flame. With gas oil the smoke number was zero even at very low excess air, indicating that the level of solids was greatly reduced when recirculation was applied. The total amount of heat transferred with high temperature recirculation was almost identical with the heat transferred from a non-recirculating flame. Owing to the difficulty of handling hot gases and the formation of sulfur trioxide at the point where the air and the recycled gas mix, recirculation at a lower temperature will be preferable. (Author conclusions modified)

23233 APTIC NO. 43223

Moore, Robert L.

THERMATOMIC PROCESS FOR CRACKING OF GASEOUS HYDROCARBONS. *Ind. Eng. Chem., 24(1):21-23, Jan. 1932. 23 refs.*

The system of cracking gaseous hydrocarbons devised by the Thermatomic Carbon Company, Pittsburgh, Pennsylvania, including a dust control device, is described. The system consists of four major parts: cracking units, composed of checkerwork furnaces; coolers; carbon collectors; and packing. The furnaces are 14 ft in diameter and 25 ft high, and consist of a riveted steel shell, insulated and lined with refractory brick and filled with checkerbrick, similar to a blast-furnace stove. Temperatures in the furnace are 900-1400 C. The process is intermittent, the checkerwork being first heated by a blast of natural gas and air introduced at the bottom, after which the stack is closed and natural gas is added from the top of the furnace for the decomposing part of the cycle. Smoke from the furnace is passed through a cooler chamber where sufficient water is sprayed countercurrent to the gas stream to cool the smoke sufficiently to allow it to be safely filtered through the cloth bags in the collectors and yet not wet either the bags or the carbon. (Author abstract)

23234 APTIC NO. 42620

Morita, Yasuhiko and Tadao Otsu

EXHAUST GAS CLEANING DEVICE. *(Haiki gasu no joka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-10567. 2p., March 30, 1972. (Appl. June 9, 1967, 1 claim).*

This invention is designed to clean automotive exhaust gas. The air supply pump is operated by a battery operated motor of the automobile. The motor rotation is controlled by a variable resistor connected with the accelerator. The air supply is controlled by the resistor in the amount corresponding with the gasoline consumption. When the accelerator is stepped on, resistance increases and the rotation of motor decreases; the air from the pump automatically decreases. Therefore, when the gasoline supply is excessive and a large amount of hydrocarbons is emitted in the exhaust gas, a corresponding amount of air is supplied into the exhaust valve and toxic elements are completely oxidized before the gas is emitted.

23235 APTIC NO. 43427

Morrison, Jim

IFP HAS ECONOMIC PROCESS FOR REMOVING SULFUR FROM FUEL OIL. *Oil Gas Intern., 11(2):30-32, Feb. 1971.*

The Institut Francais du Petrole (IFP) has developed a direct method for lowering the sulfur content of residual fuels, the heart of which is a new type of catalyst that is highly resistant to deactivation by impurities such as vanadium and nickel. The process offers an attractive technique for simultaneously improving fuel oil sulfur, viscosity, and pour point properties. The IFP process involves mixing the feedstock and hydrogen together prior to preheating. Before being sent to the fixed-bed reactor, the feed stream is quenched with a part of the recycle gas. The remainder of this gas is used as a quench in the reactor. Effluent taken from the bottom of the reactor is cooled by heat exchange against the feed/hydrogen stream. The desulfurized product is sent to a high-pressure separator from where the gas goes to purge or a recycle compressor. The heavier liquid hydrocarbon product is finally stabilized in a stripper column. Equipment and process economics are discussed.

23236 APTIC NO. 42846

Morrison, S. Roy and J. -P. Bonnelle

SURFACE STATE ADDITIVES IN THE CATALYTIC OXIDATION OF CARBON MONOXIDE. *J. Catalysis, 25(3):416-424, June 1972. 10 refs.*

A catalyst system with zinc oxide as a support and redox couples deposited as additives on the surface was examined as a catalyst for carbon monoxide oxidation. The Fermi energy of the system was controlled by these surface state additives, as determined by a study of the electrical properties of the ZnO. The rate of CO oxidation appears to depend on this control of electron availability. Manganese and chromium additives with a low surface state energy cause an active catalyst, while additions of iron cyanide with a high surface state energy lead to an inactive catalyst. The low temperature form of adsorbed oxygen, probably the negatively charged oxygen ion, is the active form for CO oxidation. A low Fermi energy increases the ratio of the low temperature to high temperature form and thus increases the catalytic activity. The experiments illustrate a new experimental technique, where the electrical properties of a supported catalyst are monitored by using a suitable chosen support. (Author abstract modified)

23237 APTIC NO. 42953

Mortstedt, S. -E., N. Walde, and G. Ekberg

REPORT ON TRAVELS MADE TO ENGLAND IN 1966. *(Reserapport - Englandsresa). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-11, 21p., July 13, 1967. 15 refs.*

Observations and experiences gained during a trip to England in 1966 are presented. The legislation on automotive exhaust is concerned with diesel exhausts, and so is state-sponsored research and development, while both research and development in gasoline engine exhaust area is conducted by the auto and to a lesser extent by the petroleum industry. A promising gasoline injection system has been developed, and studies on the effects of suction and ignition as well as of combustion chamber geometry on the exhaust are in process. The observations indicate that the exhaust emissions can be controlled by adequate solutions applied to the engine rather than by modifying the fuel composition. Carburetor and ignition adjustments, as well as addition of fresh air to the exhaust gas immediately in the exhaust valves area are the most important exhaust control measures. Barium sulfonate additives to diesel fuel had positive effect on the diesel exhaust without decreasing the engine performance. Such additives, used in an optimum proportion of 0.8%, are toxic, whereas dilution by a factor of 500 to 1000 can be regarded as sufficient.

23238 APTIC NO. 42961

Mortstedt, S. -E., N. Walde, K. -E. Egeback, and F. Karlsson

DETERMINING EXHAUST EMISSIONS FROM SWEDISH GASOLINE-FUELED AUTOMOBILES. *(Kartlaggning av avgasemissioner fran svenska bensinbilar). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-16, 14p., March 4, 1968.*

A test series was performed on 92 cars of five different models (Volvo, Saab, Volkswagen, Opel, and Ford), representative for the Swedish car population, to evaluate carbon monoxide and hydrocarbon emissions. The tests were performed after hot start, and included both USA and ECE-tests, as well as the determination of the air-fuel ratio under idling and drive conditions. Further ECE-tests after carburetor and ignition adjustments were carried out. The arithmetic mean of the CO emissions under idling conditions was 5.90% by volume, and the CO and HC emissions determined according to the ECE-test were 32.7 g/km and 1.78 g/km, respectively. The corresponding values obtained according to the USA-test were 21.4 and 1.53 g/km. The ECE-tests performed following carburetor and ignition adjustments revealed reduced CO and HC emissions (26.3 and 1.65 g/km) as well as decreased fuel consumption. A comparison of emission data as obtained from standard tests and tests after hot start is given.

23239 APTIC NO. 42966

Mortstedt, S. -E., N. Walde, K. -E. Egeback, and F. Karlsson

INVESTIGATION OF AUTOMOBILES EQUIPPED WITH EXHAUST CONTROL DEVICE. *(Undersokning av bilar med system for avgasrening). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-17, 16p., March 8, 1968. 3 refs.*

Standard ECE- and USA-tests and hot start tests were carried out on different cars equipped with four different types of exhaust control devices. The exhaust control devices, designed to reduce carbon monoxide and hydrocarbon emissions by means of proper fuel supply and ignition adjustments, were a modified fuel dosaging system (Volvo), a device developed for 1968 U. S. car models (Saab) a Volkswagen system designed for Wolkswagen 1500 model, and a Bosch type fuel injection system with electromagnetically controlled injection valves for Volkswagen 1600 model. The arithmetic mean of the carbon monoxide concentration as measured during idling was 2.65%. The specific CO and HC emissions as measured according to the ECE-tests were 24.7 and 1.09 g/km. The USA-test for which the exhaust was sampled in plastic bags, revealed 16.9 g of CO and 1.07 g of hydrocarbons/km. Results of durability tests performed by Saab AB and AB Volvo according to US-test revealed average CO emission of 1.99% for Saab V4 and 1.54% for Volvo B18, while the corresponding values for hydrocarbons were 293 ppm and 240 ppm.

23240 APTIC NO. 43135

Mortstedt, Sten-Erik

POSSIBILITIES OF ABATING DIESEL-ENGINE EXHAUSTS. *(Mojligheter att forbattra dieselmotorers avgaser). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-72, 16p., Sept. 20, 1971. 11 refs.*

Different possibilities of abating Diesel engine exhausts are described. Nitrogen oxides and dust are the main components of Diesel engine exhausts. Calculations revealed that the dilution required for exhausts from conventional gasoline engines and comparable two-stroke direct-injection Diesel engines is nearly twice that required for four-stroke direct-injection Diesel and preignition engine exhausts. Low-exhaust Otto engines and conventional preignition engines with 100% dust separation are hygienically equivalent, and represent the best types. Direct injection Diesels emit less dust, but higher amounts of nitrogen oxides, than preignition designs. Overcharged engines are superior to non-overcharged types regarding dust emissions, particularly under high loads. The application of turbulence chambers results in low smoke under low load conditions, and in reduced carbon monoxide, hydrocarbon, and nitrogen oxides emissions under medium loads, while increased performance and efficiency are also obtained in Diesels with turbulent flow in the combustion chamber. Low octane ratings and highly retarded ignition timing result in low smoke density, while preheated air should be applied for regular Diesel fuel only. Propane injections as well as barium and calcium carbonate additives slightly reduce the smoke emission. Retarded injection timing, exhaust recirculation, or water injection to the fuel reduce the CO, hydrocarbon and nitrogen oxides emissions. A combination of retarded injection timing with turbulence chamber or turbulent flow in the combustion chamber seems to be most promising.

23241 APTIC NO. 43660

Mortstedt, S. -E., K. -E. Egeback, and K. J. Bjorkquist

THE ROLE OF THE CARBURETOR IDLING ADJUSTMENT ON THE EXHAUST EMISSION. *(Betydelsen av forgasarens tomgangsinstallning for bilens avgasemission). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-14, 43p., Oct. 27, 1967.*

The effect of the carburetor idling adjustment on the carbon monoxide and hydrocarbon emissions was investigated on Saab 95 V4, Volvo Amazon B 18 A, and Volkswagen 1500 Limousine car models. Though the tests, performed according to the European and California cycles with hot engines, are related to individual cars, the results can still be regarded as representative of cars with the same motor design. The results indicate unambiguously the positive effect of lean air-fuel mixtures on both CO and HC emissions. An idling adjustment to 1-2% of CO for both Saab and Volvo resulted in a reduction of 25-50% in the CO emission as compared to the emission with the adjustment claimed to be best in the service manual (mean value from three European cycles). An optimum idling adjustment to 3% of CO for VW 1500 reduce the CO emission by 30-40% in the European cycle compared to the adjustment specified in the service manual. Too lean idling adjustments

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both cause hydrocarbon emissions to increase, and possibly deteriorate the start, particularly during the cold season.

23242 APTIC NO. 43227

Moss, G., J. W. T. Craig, and D. Tisdall

THE FLUIDISED BED DESULPHURISING GASIFIER. *Preprint, American Inst. of Chemical Engineers, New York, 23p., 1971. (Presented at the American Institute of Chemical Engineers, National Meeting, 69th, May 16-19, 1971, Paper 3e.)*

The development of the fluidized bed desulfurizing gasifier is reported. Fuel oil is gasified in a fluidized bed of lime particles at temperatures of 850 C, using 20% of the air required for complete combustion. The reacted bed material, which carries the sulfur as calcium sulfide, is passed to a fluidized bed regenerator where it is oxidized with air at 1050 C to yield a tail gas containing about 10% by volume of sulfur dioxide. The regenerated lime is then returned to the gasifier. Virtually complete desulfurization can be achieved in a bed about 15 in. deep at a superficial gas velocity of 4-6 ft/sec. The gasifier is compact and its overall height is dictated by the design of the cyclones which are needed to retain the bed fines. The lime bed also retains vanadium. Feasibility studies have been undertaken on a batch basis with successive absorption and regenerations carried out in the same bed.

23243 APTIC NO. 42308

Mueller, Hans-Georg

POWER SUPPLY OF ELECTRICALLY DRIVEN CARS. *(Stromversorgung elektrisch angetriebener Kraftfahrzeuge). Text in German. Automobiltech. Z. (Stuttgart), 74(6):239-244, June 1972. 7 refs.*

In the wake of efforts to stem pollutant emissions by conventional car engines, development of electric drives has experienced a revival. Due to its low noise and exhaust gas emission, the electric car would be suitable for use in densely populated areas. The lead-acid-battery is the most economical storage element, although it still requires further development in the direction of reducing weight. In the near future the electric car will be only used for urban and suburban public transportation. Basically, three methods of power supply are feasible. First, the battery is re-charged in the car overnight. Such cars can span a distance of 50 km during the day. Secondly, the battery is exchanged at special stations. A sufficiently dense network of exchange stations would solve the limited-distance problem. Thirdly, the electric energy is generated in part in the car by a three-phase ac-current generator which is driven by a conventional combustion engine. A sufficiently large battery is used for driving through the inner city; in the suburbs, the generator-combustion engine takes over and simultaneously charges the battery. In view of the limited use of electric cars for public transportation, the power demand will not be higher than 2% of the total power demand. When it is further considered that the electric power will be increasingly produced by nuclear plants the argument that the emission problem is shifted from the exhaust pipe to the stack of the power plant does not hold.

23244 APTIC NO. 42347

Muller, J. L.

AN ASSESSMENT OF THE FEASIBILITY OF A DIRECT-FIRED OPEN-CYCLE GAS TURBINE BURNING PULVERISED SOUTH AFRICAN BITUMINOUS COAL. *S. African Mech. Eng. (Johannesburg), 20(10):342-350, Oct. 1970. 27 refs.*

South Africa has large supplies of cheap coal as its major indigenous fuel. If coal-burning gas turbines of relatively low capital cost were available, they could be used to economic advantage for power generation in those areas where water is scarce and the cost of transmitting power over long distances from large steam or nuclear power generation plants is high. The feasibility of a direct-fired open-cycle gas turbine, burning pulverised South African bituminous coal, was investigated. The results of the research indicate that attainment of the degree of reliability associated with conventional gas turbines would be extremely difficult. In addition, the high ash content of typical South African bituminous coals and the general abrasiveness of its ash are such as to make the development of an open-cycle gas turbine, directly fired by means of pulverized coal, not worth pursuing at the present time. Successful development of this system would require the availability of suitable turbine blade materials having a resistance of ten to twenty times as great as conventional Nimonic materials. The solution to the problem of fuel must, therefore, be sought among the alternatives of chemical conversion of the coal or use of a method of combustion such as fluidized-bed combustion which results in only a small carry-over of coal ash to the separators and turbine blades.

23245 APTIC NO. 42624

Muroki, T.

THE EXHAUST GAS PROPERTIES OF THE ROTATING COMBUSTION ENGINE AND MEASURES AGAINST AIR POLLUTION. *(Das Abgasverhalten der Kreiskolbenmotoren und Massnahmen gegen die Luftverunreinigung). Text in German. Motortech. Z. (Stuttgart), 33(6):255-260, June 1972.*

Different factors influencing the hydrocarbon, carbon monoxide, and nitric oxide emissions from rotating combustion engines and exhaust control measures for such engines are described. Rotating combustion engines discharge more hydrocarbons and less nitrogen oxides than conventional engines. The highest hydrocarbon concentrations were found to occur near the bottom dead center. While the air-fuel ratio had practically no effect on the hydrocarbon, CO, and nitrogen oxides emissions, proper ignition timing was an effective means of reducing the hydrocarbon, and, especially under high loads, the NO contents. The engine speed strongly influenced the hydrocarbon and CO emissions, as increased speed resulted in very rapid decrease of hydrocarbon content, whereas the hydrocarbon concentrations continued to be high at high speeds under low load conditions. The effect of the load conditions was of minor importance. Improved combustion chamber design was developed to reduce hydrocarbon emissions. Double chamber afterburning reactors were found to be superior to single chamber designs, while the amount of secondary air required for afterburning was determined to be function of both the hydrocarbon concentration and the exhaust flow rate. Effective measures against hydrocarbon emissions were elaborated: maximum retardation for upper spark plug, controlled by engine speed and vacuum under low speed and load conditions, and interruption of the secondary air flow, controlled in the same manner, under high speed and low conditions. No-lead gasoline, having an octane rating of 70-80, can be used for rotating combustion engines.

23246 APTIC NO. 43418

Murthy, B. N.

ODOR CONTROL RESEARCH. *Preprint, National Air Pollution Control Administration, Cincinnati, Ohio. Div. of Process Control Engineering, 24p., March 1969. 41 refs.*

The state of technology for odor control and evaluation is reviewed. Odor surveys indicate that the most common odor emission sources are chemical and pulp factories, petroleum and mineral refineries, and food stuff waste product and animal rendering industries. No suitable method or instrument is available for measuring odors objectively, and odor measurement techniques in current use are mainly subjective. Techniques that can be used for odor control are ventilation, absorption, chemical reaction, process changes, odor modification, combustion, and scrubbing. Of these, scrubbing offers the advantage of not being highly specific to particular odorous compounds. Research needs for the development of scrubbers to control odors are discussed. Simple odorous systems amenable to accurate analysis should be selected initially. Gas chromatographic equipment will be used for analysis of odorants, and the effect of operating variables on the efficiency of odor control will be studied on a bench scale. Results from these studies will be used to form the input for pilot-scale scrubber systems. (Author summary modified)

23247 APTIC NO. 42656

Nakamura, Harutoki

AUTOMOBILE EXHAUST GAS PURIFICATION DEVICE. *(Jidosha haigasu joka sochi). Text in Japanese. (Matsushita Denki, K. K. (Japan)) Japan. Pat. Sho 47-14721. 2p., May 2, 1972. (Appl. Dec. 15, 1969, 1 claim).*

A method of catalytic purification of automobile exhaust gas is presented. Small diameter glass fibers are used as carriers. Some organic catalyst of 10 to several 100 mesh powder is adhered between the glass fibers, using water or some other type of adhesive. The carrier and catalyst are heated and the adhesive is evaporated or decomposed, and an even catalytic layer is formed on the surface of the carrier. The catalyst is installed in a special compartment in the exhaust gas chamber, and the loss of catalyst is prevented. Engine exhaust gas enters from one end, goes through the catalytic layer, which has wide gaps between the carrier fibers covered by the catalyst, and goes out from the other end.

23248 APTIC NO. 42338

Nakano, Koichi

PROBLEMS OF SULFUR RECOVERED BY DESULFURIZATION SYSTEM. *(Datsuryu ni yoru kaishu io bun no mondaiten). Text in Japanese. PPM, (Japan), 3(7):14-20, July 1972. 9 refs.*

A general discussion on the present status and the problems of desulfurization is given. In 1970, 192,560,000 kl of crude oil were imported, of which, 90% was high sulfur content oil. At the present time, the hydrodesulfurization of crude oil, in which sulfur is converted into hydrogen sulfide and removed, is receiving much study. The direct desulfurization method can remove up to 70% of the sulfur content, but the catalyst is always seriously poisoned by the trace vanadium, nickel, and asphalt content in the oil. The development of the catalyst has been a major problem. The same problem does not exist in the indirect method, where distillate is desulfurized and recombined with the residue, but only a 40% desulfurization can be accomplished. Flue gas from the combustion of crude oil contains less than 0.2% sulfur dioxide. However, the amount of treatment is usually so large that the operation cost becomes a major problem. The sulfur from the desulfurization process is usually recovered as simple sulfur, sulfuric acid, gypsum, ammonium sulfate, and sodium sulfite. These are supplied to the markets in Japan and foreign countries.

23249 APTIC NO. 43426

Nakano, Kinzo, Kazuo Hishida, and Minoru Takeda

CHARACTERISTICS AND TREATMENT OF WASTE GAS FROM MELTED ZINC PLATING PROCESS. *(Yoyu aen mekki no tomonau haigasu no seijo to taisaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):78, 1969. (Presented at the Japan Society of Air Pollution, Annual Meeting, 10th, Tokyo, Japan, 1969, Paper 77.)*

To establish guidance standards for the control of ammonium chloride dusts produced in melted zinc plating, the conditions of the flue gas and properties were measured. The conditions and quantities of emissions depend greatly on the flux for zinc plating, the plating recipient objects, and the condition of flux. When the plated material is flat, smooth, and dry, the amount of emission is limited; in the reverse case, the emission increases. When new flux is added, a great quantity of thick fume is emitted. When particularly small objects are plated, pulverized NH4Cl is sprayed on them. Since the objects are still hot, most of NH4Cl turns into fume. Using a glass filter with a cascade impacter, dusts were captured and measured. Of the results captured in four hours, 0.3% were larger than 10 micron particles; 1 to 2% were 3 micron particles; and the rest were less than 1 micron particles. The consistencies were NH4Cl, zinc chloride, zinc oxide, ammonia, and hydrogen chloride. The amount of the flue gas had a correlation with the quantity of NH4Cl used in the process; therefore in order to reduce gas emission, the amount of NH4Cl shoud be reduced. For dust control, high performance scrubbers, filter collectors, or other types of dust collectors of more than 60% rate should be used when less than 50 kg/day of flux is used. When more flux per day is used, equipment of better than 80% collection rate should be used so that the concentration at the exit should be 0.04 g/N cu m.

23250 APTIC NO. 42329

Naslund, Greger and Marianne Sandstrom

REPROCESSING OF SOLID WASTES. FUTURE GIANT INDUSTRY. *(Ateranvandning av fast avfall - en framtida storindustri)? Text in Swedish. Kem. Tidskr., 83(11):38-40, 42, 1971. 7 refs.*

Different methods of reprocessing solid wastes are described with special regard to incineration and pyrolysis. The waste gases from incineration, resulting in a weight reduction of 85-90%, contain carbon dioxide, water, and other pollutants such as hydrochloric acid, soot, and dust. While the particulate pollutants can be readily separated by means of electrostatic filters, for example, the effective removal of gaseous substances creates problems. Experiments indicate the possibility of utilizing hot waste gases as energy source for pyrolytic processes. Waste gases with 1000 C temperature and an oxygen content of 5% were used for partial oxidation in pyrolysis studies.

23251 APTIC NO. 42415

Natusch, D. F. S. and J. R. Sewell

A NEW SOLID FILTER FOR INDUSTRIAL ODORS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 948-955. 21 refs. (Dec. 6-11.)*

The reaction between manganese dioxide and hydrogen sulfide was studied to determine the efficiency of an MnO2-impregnated sawdust filter for industrial odor counteraction. A highly active form of MnO2 is prepared by reducing potassium permanganate with sawdust in a neutral or alkaline solution. The activity of impregnated sawdust depends on the type of wood used, the amount of KMnO4 used, pretreatment of the sawdust with sodium hydroxide, and the temperature of the reactin. Impregnated sawdust will remove H2S from air to a degree depending on the humidity of the air, the flow rate through the filter, air temperature, and sawdust particle size. Impregnated sawdust also reacts rapidly with a number of gases, notably sulfur dioxide, at room temperature. Impregnated sawdust filters are effective in pilot scale plants for removing sewage odors, meat rendering odors, and H2S from air. (Author abstract modified)

23252 APTIC NO. 42687

Nishikawa, T.

ON NEW METHODS AND DEVICES FOR DUST COLLECTION. *(Atarashii shujin hoho to sochi ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 39(7):686-690, July 1972.*

A new type of electrostatic precipitator (EP) is discussed. Whereas the dust-collecting electrode (grounded) of a conventional EP is made of an electroconductive material such as iron, aluminum, or stainless steel, the new Space Cleaner electrostatic dust collector can make use of bad conductors as the dust-collecting electrode. Developed from the idea that such bad conductors or even dielectrics such as concrete, earth, sand, rock, and wooden board can be made dust-adsorbing if the potential difference between the two electrodes is big enough, it uses voltage ranging from 100 KV to 200 KV (DC). The charged electrode is 0.5 mm to ensure effective corona discharge, while the distance between the two electrodes is made larger (about 1 m) for a larger electric field, compared with a conventional EP. When installed in a tunnel, it utilizes the tunnel wall as the dust-collecting electrode. Its dust-collecting efficiency is not affected by temperature fluctuation of the exhaust gas enough to require specialcontrol. It can adsorb particles of even greater specific resistance and is free of counter ionization. Also, it can arrest finer particles generally very hard to arrest, and power consumption is about 1/10 that of an EP. The Space Cleaner needs no duct or pipeline to collect polluted air but is installed right in the place where air should be cleaned. It is available in several types, each designed for a specific use or place of use.

23253 APTIC NO. 43364

Nishisugi, Ryoji

DUST COLLECTOR. *(Shujinki). Text in Japanese. (Japan Engineering Co., Ltd.) Japan. Pat. Sho 47-9415. 3p., April 10, 1972. (Appl. Dec. 15, 1969, 1 claim).*

This stack is designed to increase the natural precipitation of dust particles before stack gas is emitted to the air, by installing a number of obstacles and guides as part of the stack. At the top of a stack, approximately 1 m in diameter, a conical umbrella of a 4-m diameter is installed. A number of concentric partitions and wire mesh curtains are suspended from the umbrella, outside the stack proper. The dusts emitted with the smoke collide into these obstacles and fall into the funnel shaped dust catcher with the same diameter as the umbrella, which is installed underneath. Large dust particles fall close to the stack, and smaller size particulates are caught by the wire mesh nets toward the outside. The gas temperature and speed drop considerably before the smoke is finally emitted outside the wire mesh curtains.

23254 APTIC NO. 42798

Odagiri, Wataru and Tomoji Mizuno

SPARK-OVER DETECTION APPARATUS OF ELECTROSTATIC PRECIPITATOR. *(Denki shujinki ni okeru hibana senraku kenshutsu sochi). Text in Japanese. (Hitachi Ltd., Tokyo (Japan)) Japan. Pat. Sho 46-30153. 3p., Oct. 18, 1971. (Appl. April 10, 1968, 1 claim).*

This invention relates to a simple spark-over detection apparatus of an electrostatic precipitator without the use of a semi conductor element, such as a transistor. A detecting resistence is placed at the direct current output of the all wave rectifier which detects the voltage at the low-voltage side of the boosting transformer. A condenser, charged at a voltage corresponding to the voltage drop of the second resistence which, accompanied with the first resistence, divides the terminal voltage of the detecting voltage, is attached to the second resistence. The spark-over is detected by the terminal voltage of a third resistence, which is equipped for the indication of voltage while the condenser discharges.

23255 APTIC NO. 43512

Oettli, Alfred, Werner Kammerer, and Otto Graf

THE NEW GARBAGE INCINERATOR FACILITY IN THE CITY OF BASEL. *(Die neue Muellverbrennungs-anlage der Stadt Basel). Text in German. Staedtehygiene (Uelzen/Hamburg), 21(4):88-94, April 1970.*

The new waste incinerator plant of the city of Basel, serving 420,000 inhabitants, is described. The waste is dumped into a silo so that no dust or odorous emissions occur. The waste, preheated to 300 C, is incinerated in a low-pressure furnace with reciprocating step grates for which the air supply and the temperature can be individually adjusted. The incineration is made at a minimum temperature of 800 C to avoid odorous emissions. The waste gases to be cleaned are conveyed through a steam generator, where dust is partially separated, to preheat the feed-water to about 350 C and the combustion air to 300 C. The dust separation is made by a 60,000 V-electrostatic filter where the dust content is reduced from an average value of 8 g/N cu m to a residual concentration of 100 mg/N cu m. When a maximum dust concentration of 16 g/N cu m is reached, the residual concentration is 160 mg/N cu m, maximum. The electrostatic filter is followed by special cyclones designed to separate cource particles. The incinerator plant, including an oil-firing relief boiler, supplies electric energy and steam for nearby consumers.

23256 APTIC NO. 42632

Ogaki, Takashi

WET-TYPE DUST COLLECTOR. *(Shisshiki shujinki). Text in Japanese. (Shinko Machine Engineering Co., Kobe (Japan)) Japan. Pat. Sho 47-1272. 5p., Jan. 13, 1972. (Appl. Aug. 4, 1969, 1 claim).*

This invention relates to the improvement of a cyclone-type wet dust collector. The dust collector consists of a washing chamber and a cyclone chamber. The dust-containing gas is introduced to a cylindrical washing chamber, where high pressure nozzles are equipped at a tangent direction, and larger particles are washed and removed from a drain in the chamber while the air is circulating. Three concentric filters are placed in such a way that the holes are alternatively arranged. The moisture-containing gas with small particles is then led through the filters, where most of the particles are washed and removed. The resulting gas is then led to a cyclone, which is connected below the washing chamber, and separated for the moisture and the trace amount of dust. Purified gas is discharged from a center pipe.

23257 APTIC NO. 42703

Olcott, T. M.

DESIGN OF A SPACECRAFT CONTAMINANT CONTROL SYSTEM. *Preprint, Society of Automotive Engineers, Inc., New York, and American Society of Mechanical Engineers, New York, 16p., 1971. 3 refs. (Presented at the Society of Automotive Engineers, American Society of Mechanical Engineers, American Institute of Aeronautics and Astronautics, Life Support and Environmental Control Conference, San Francisco, Calif., July 12-14, 1971, ASME Paper 71-Av-19.)*

Contaminant control on manned spacecraft becomes increasingly more important as crew sizes and mission durations increase. Larger crew sizes involve a wider variety of equipment and hence a greater number of potential contaminants, while longer mission durations necessitate a reduction in the allowable contaminant concentrations. Control of a large number of contaminants requires a system involving many elements, and candidate removal concepts include catalytic, oxidation, chemisorption, and charcoal adsorption. Charcoal adsorption can be accomplished utilizing either regenerative or nonregenerative techniques. A system design is described which integrates these various elements, including the design methodology and the results of a computer program utilized to predict the performance of charcoal beds. Results of long-term design verification testing with a model system are also presented. (Author abstract modified)

23258 APTIC NO. 43566

OMara, Richard F. and Carl R. Flodin

ELECTROSTATIC PRECIPITATION AS APPLIED TO THE CLEANING OF GRAY IRON CUPOLA GASES. *Air Repair, 3(2):105-108, Nov. 1953. 6 refs.*

The physical, chemical, and electrical characteristics of gray iron cupola dust and fume discharge materials, and the importance of those factors in the design and performance of Cottrell electrical precipitation equipment are described. Where a high efficiency is required in the removal of dust and fume from cupola gases to meet requirements covering solid emissions and opacity, the electrical precipitation process is a satisfactory solution. It is extremely difficult, however, to precipitate silica fume without conditioning the gases; this is also true of some of the metallic oxides, such as lead and zinc. Another index to possible difficulty in the electrostatic precipitation of suspended solid from a gas stream is the apparent electrical resistivity of the dust or fume. Developmental work by the foundry industry in the Los Angeles area on wet and dry Cotrell operation is reviewed.

23259 APTIC NO. 42738

ONeal, A. J. and C. A. Kroetz

EMISSIONS FROM TALL STACKS CONTRIBUTE VERY LITTLE TO GROUND LEVEL SULFUR DIOXIDE. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers (AIME), New York, N. Y., 20p., 1971. (Presented at the American Inst. of Mining, Metallurgical, and Petroleum Engineers Annual Meeting, New York, Feb. 26-March 4, 1971.)*

Long Island Lighting Company operated an extensive monitoring system on Long Island for over 3 years. The Northport power plant was studied because it emits more sulfur dioxide than any other company plants, has the highest stacks, and the most irregular terrain. The plant emits about 100 tons of SO2 from each of two units per day, discharging it through 600-foot stacks at velocities up to 90 FPS at about 320 F. The ground sensors could barely detect this SO2 influence with one unit in service, and it was no more detectable after the second unit went on-stream. The heart of the monitoring system was the West Gaeke method with 11 samplers in service. Ten electroconductivity instruments were also installed to give back-up recorded information from time to time. Three weather stations also recorded dominant wind direction, average wind velocity, and gustiness for each hour of the year. The following contributions to ground level SO2 from the two stacks of the Northport plant took place: winter months: zero to the south and southeast; spring months: zero to the south and 5.5 ppb to the southeast; summer months: 4 ppb to the south and zero to the southeast; and fall months: 4 ppb to the south and 0.5 ppb to the southeast. The average of all seasons, three-year basis, was 1.8 ppb.

23260 APTIC NO. 42357

Padovani, C. and P. Sturla

AIR POLLUTION CONNECTED WITH THE COMBUSTION OF THE SULPHUR CONTAINING FUELS IN LARGE THERMAL PLANTS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 851-860. (Dec. 6-18, Paper EN 29E.)*

Air pollution by sulfur oxides in the stack gases of heat-generating 0plants fired with sulfur-bearing fuels, has been growing as a key problem for all concerned. Serious efforts should be made to base air quality standards for ground level concentrations on a better knowledge of toxicity limits, with due regard to the possible synergetic effect of other pollutants. The only available control measure for this pollution is the dispersion by high stacks, of which the height is calculated by well known prediction formulae or mathematical models. The out-and-out measure of legally limiting the fuel sulfur content still seems problematic and overly expensive, in view of the fuel cost influence on the end cost of power generated. Some processes for stack gas desulfurization appear to be promising. Studies on possible new uses of sulfur compounds should be promoted on an international basis. Intended legal regulations to limit air pollution are based on the general obligation imposed on the producer to adopt the best technically available means for reducing to a minimum the emissions and on the respect of hygienic standards or limits for the ground level concentration. International cooperation should also be undertaken for standardizing the sampling, measuring, and survey techniques. (Author conclusions modified)

23261 APTIC NO. 43352

Page, Gordon C. and Robert M. Bethea

THE COLLECTION OF LINT FLY BY WET IMPINGEMENT. *J. Air Pollution Control Assoc., 22(5):372-373, May 1972.*

A combined water scrubber-impinger was used to control lint cleaner effluent from machine-stripped short staple cotton because of its high efficiency and low pressure drop. Water to the chamber s six double-spray and two single-spray nozzle taps was supplied from recycle and makeup sources at 7.5-30 psig, with total flows of 21.8-31.1 gpm depending on the number of nozzle taps in use. A lint skimming technique was used for the trash-water spearator. The lint and dust-laden water flowed from the scrubber to the first of two settling tanks. Here the wet lint containing some entrapped trash was skimmed off the water surface by a baffle inclined 70 deg to the direction of water flow. The lint passed across the baffle and out the drainage notch where it was caught by a porous sack placed in a drum. Two series of tests indicated that particulate removal is unaffected by changes in air flow rate, spraying rate, or number of spray nozzles in use. The most significant result probably is the nine-fold decrease in particulate matter when the scrubber is in operation. Systems of this type should also be useful in cotton seed oil mills, grain storage elevators, and feed mills.

23262 APTIC NO. 42829

Pahnke, Alden J. and Wilfred E. Bettoney

ROLE OF LEAD ANTIKNOCKS IN MODERN GASOLINES. *Preprint, Society of Automotive Engineers, Inc., New York, 32p., 1971. 68 refs. (Presented at the Society of Automotive Engineers, National Combined Fuels and Lubricants, Powerplant and Truck Meetings, St. Louis, Mo., Oct. 26-29, 1971, Paper 710842.)*

The role of lead antiknocks in modern gasolines is discussed in terms of engine-fuel relationships. Exhaust emission characteristics of leaded and unleaded gasolines are compared in terms of both gaseous and particulate constituents. The effect of removing lead from gasoline on engine cleanliness, exhaust valve seat recession, octane requirements, and octane requirement increase is assessed. Overall, the effect of leaded fuel on deposit-induced hydrocarbons emissions is an increase of about 7%. Exhaust particulate emissions on a grams/mile basis are higher for operation of leaded fuel than on unleaded fuel. On a volume basis, the amount of particulate emitted with leaded fuels is less than that emitted with unleaded fuels. Since atmospheric visibility and soiling are probably dependent on the volume of particulate present, a shift from leaded to unleaded gasoline would be expected to decrease visibility and increase soiling. Laboratory and field tests have shown this to be the case. The octane requirement increase associated with the use of unleaded gasoline is equal to or perhaps slightly greater than that associated with leaded fuels. A shift from leaded to unleaded gasoline might discernibly increase the formation of sludge and varnish deposits. Data developed in an owner-driven, 122-car service test over a period of 4.7 years show a maintenance cost disadvantage for leaded fuels over unleaded fuels of 0.052 cent/mile, or 0.72 cent/gal at a fuel economy of 13.8 miles/gal.

23263 APTIC NO. 43325

Peoples, Jerry A.

RANKINE CYCLE POWER SYSTEMS FOR AUTOMOTIVE APPLICATION. *Advan. Astronaut. Sci. Suppl., vol. 26:213-229, 1971. 2 refs. (Presented at the American Astronautical Society and the American Institute of Aeronautics and Astronautics, Special Technical Event, Winrock, Ark., Oct. 30, 1970, Paper AAS70-081.)*

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The entire problem of a steam automotive system is manifested in the control required to maintain boiler pressure and temperature under varying loads, throttle changes, and engine cutoff settings. The control approach taken by current steam car designs is based on a fuel rate proportional to the pressure error between command and actual pressures. Speed and power are controlled by the throttle which can be varied manually by the operator. The variable pressure boiler (VPB) concept overcomes the control problems of the conventional fixed boiler pressure concepts. A passive control concept is discussed which allows the boiler pressure to seek its own equilibrium level. The throttle is eliminated. The block diagram for conventional steam system operation is reviewed and compared with the VPB block diagram. Advantages of the VPB concept are discussed in terms of passive pressure control and system performance. A new approach to control of the modern steam automotive system, known as the Run Wild concept, is introduced, wherein the primary valve is wide open at all times (100% throttle), the power and speed being controlled only by the fuel rate input. (Author abstract modified)

23264 APTIC NO. 42344

Perry, Robert Bruce

ABSORPTION UNIT. *(Du Pont de Nemours (E. I.) and Co., Wilmington, Del.) U. S. Pat. 3,656,280. 4p., April 18, 1972. 7 refs. (Appl. Aug. 27, 1968, 1 claim).*

An absorption unit is described which has an absorption medium that is relatively simple to manufacture, provides intimate contact between gas and absorption liquid, and at the same time is substantially nonclogging, easy to clean, and results in minimum impedance of the gas flow. The unit comprises a housing with a passage, at least one absorption medium positioned within the passage, and means for distributing an absorption liquid. The passage of the gas through the aperture in the absorption plates results in the formation of bubbles. The bubbles maximize the gas liquid interface and result in a degree of absorption from the gas which can be equal to or greater than absorption media requiring a circuitous path of the gas through an absorption medium. Construction materials and efficiency requirements are indicated for the absorption plates.

23265 APTIC NO. 42316

Petersen, Gerd Hugo

APPARATUS FOR AGGLOMERATING AND PRECIPITATING SUSPENDED MATTER OUT OF GASES AND VAPORS AND/OR FOR ABSORBING GAS COMPONENTS. *(Assignee not given.) U. S. Pat. 3,653,187. 12p., April 4, 1972. 5 refs. (Appl. May 20, 1970, 19 claims).*

A method and apparatus are provided for agglomerating and precipitating suspended matter out of gases and vapors and/or absorbing gas components in a wet process. This is accomplished using centrifugal acceleration in treatment chambers which rotate about a shaft and which have radial partition walls, wherein the gases to be treated are passed radially inward in the opposite direction to the field of gravity. The treatment chambers are arranged in a spiral housing with a tangential gas inlet and axial gas outlet. The gas to be treated enters the spiral housing tangentially on its outer periphery at a high velocity. It is sucked radially through the treatment chambers and leaves the housing purified passing through a central gas outlet. Due to the rotation of the treatment chambers, a gravity field is produced the direction of which is opposite to the direction of the flow of gas. Gases and vapors to be purified receive such a high centrifugal acceleration that the suspended particles they contain are separated out in the direction against the gas and vapor flow. This effect is enhanced by additional injection of fluid. (Author abstract modified)

23266 APTIC NO. 42940

Pilpel, N.

INDUSTRIAL GAS CLEANING. *Brit. Chem. Eng., vol. 5:542-550, Aug. 1960. 59 refs.*

There are five principal methods which are employed on an industrial scale for removing small particles and liquid droplets from gases and vapors: filtration, electrostatic precipitation, inertial separation, wet scrubbing, and agglomeration. Recent developments in the theory underlying these methods are reviewed, and equipment in current use for the treatment of smokes, dusts, and mists is described. Ceramic filters, fiber filters, air filters, and impregnated filters; cyclones and other inertial separators; and various gas scrubbing equipment, rotary screw agglomerators, and sonic and ultrasonic agglomeration techniques are considered. The economics of gas cleaning methods are generally discussed.

23267 APTIC NO. 42841

Plumley, A. L.

FOSSIL FUEL AND THE ENVIRONMENT--PRESENT SYSTEMS AND THEIR EMISSIONS. *Combustion, 43(4):36-43, Oct. 1971. 21 refs. (Presented at the Arizona University, Energy, Environment and Educational Symposium, Tucson, Ariz., April 5-7, 1971.)*

Significant air pollutants from combustion sources include particulate matter, sulfur oxides, and nitrogen oxides. Regardless of the firing method, there are variations in particulate emissions due to the type of fuel fired. Particulate size distribution is extremely important as it can dictate the use of certain collection equipment and effect its design. Efforts to reduce emissions of sulfur oxides are prompted by their damaging effects on plant life and possible adverse health effects. From the standpoint of equipment, sulfur oxides can be detrimental in that they contribute to corrosion and deposit problems in the boiler. Techniques are available for control of sulfur trioxide by means of low excess air and/or additives. Sulfur dioxide control can be accomplished by use of low-sulfur fuel, fuel desulfurization, and removal of SO2 from stack gas. Nitrogen oxides are air pollutants because of their participation in reactions leading to photochemical smog. The emission of nitrogen oxides can be significantly reduced by use of a suitable firing method to control the time-temperature relationship, low excess firing, or an alternate fuel. Emission reducing procedures used at the new Navajo Generating Station at Page, Arizona, are discussed. (Author summary modified)

23268 APTIC NO. 42455

Porlezza, R. and M. Valussi

AUTOMATIC CONTROL OF A WET PURIFICATION INSTALLATION FOR BLAST FURNACES IN A LARGE STEEL PLANT. *(La regolazione automatica dell impianto di depurazione ad umido del gas di alto forno in un grande stabilimento siderurgico). Text in Italian. Met. Ital., 49(4): 290-297, April 1957.*

The gas emitted from a blast furnace is combustible and is used as fuel in boilers and for other uses in steel plants, but it cannot be used as it comes from the furnace because of its high humidity and the particulate content. The humidity from the processed minerals amounts to from 5 to 20% and must be removed because it adversely affects the caloric yield of the gas. Particulates consisting of ore particles and coke dust are present in amounts up to 15 g/cu m gas. The gas is therefore purified in two steps, first by dry, then wet purification. Wet purification and the associated equipment are described. Purification is accomplished in four sections, each with an hourly purification capacity of 80,000-100,000 cu m gas. Each section comprises a washer-cooler, Dingler disintegrator provided with a blower revolving at 740 rotations/min, water jets which wash the gas to reduce the particulate content to 0.01-0.02 g/cu m, and a dryer filled with Raschig rings from which the gas enters the gasometer. The four sections are supplied with gas from a single aspirator but various circumstances prevent equal distribution of the volume of gas to each of the four sections. This causes dangerous overloads on the motors which propel the blowers in the disintegrators. A new blast furnace put into operation recently has further compounded the problem of keeping a constant gas pressure in all sections. The problem has been resolved by an automatic regulator which simultaneously regulates the opening of the valve throttle at the bottom of each Dingler on impulses received from the aspirator.

23269 APTIC NO. 42824

Quick, D. H., R. Viskanta, and E. R. F. Winter

RADIATION SHIELDING OF A POROUS SURFACE BY TRANSPIRATION OF AN ABSORBING GAS. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 10p., 1972. 19 refs. (Presented at the American Institute of Aeronautics and Astronautics Thermophysics Conference, 7th, San Antonio, Tex., April 10-12, 1972, Paper 72- 277.)*

Attenuation of thermal radiation leaving a heated plate through which an absorbing gas is injected into the boundary layer was studied analytically and experimentally. The apparatus for measuring these infrared radiant energy fluxes in specified wavelength bands is described. Radiometric measurements in the 4.3 micron carbon dioxide band were made for various injection rates. free stream conditions, starting length and plate surface temperature of about 1000 F. Injection of CO2 reduced the intensity by as much as 30% compared to values obtained with air under otherwise identical conditions. However, transpiration of CO2 may not be sufficiently effective to produce desired shielding. Particulate matter and/or a mixture of more strongly absorbing gases, such as metal vapors, may enhance the attenuation. (Author abstract modified)

23270 APTIC NO. 42991

Reiter, N. F. and A. J. Saraceno

EVALUATION AND CONTROL OF SELECTED AIR POLLUTANTS -- A LITERATURE SURVEY. *Goodyear Atomic Corp., Piketon, Ohio, Chemistry Dept., Atomic Energy Commission Contract AT-(33-2)-1, 13p., Dec. 30, 1971. 102 refs.*

NTIS: GAT-672

The current literature pertaining to the evaluation and control of fluorine and fluorides, sulfur dioxide, nitrogen oxides, and particulates is surveyed. The majority of the 102 references cited have been published in the last 5 years. Recovery, removal, sampling, and analytical techniques for the various air pollutants are pertinent topics discussed in the cited references. (Author abstract modified)

23271 APTIC NO. 42328

Retz, B. de

ACTIVITIES OF ELECTRICITE DE FRANCE IN ATMOSPHERIC POLLUTION CONTROL. *(L action d Electricite de France en matiere de prevention et de surveillance de la pollution atmospherique). Text in French. Ann. Mines (Paris), 11(5):31-44, Nov. 1970.*

Nature and origin of pollutants discharged by conventional and nuclear power plants as well as basic methods applied in France to control power plant-generated emissions are reviewed. The waste gases contain sulfur dioxide, as well as oxides of nitrogen and carbon, while solid pollutants consist of dust and unburned particles. The sulfur content of coal, fuel oil, and natural gas used in France are 0.5-1%, 0.4-3%, and 0.0002%, respectively. Carbon monoxide emissions can be reduced to or below 0.01%. Dust separation can be made by means of electrostatic separators at an efficiency of 98-99%, and oil desulfurization, SO2 removal, or temporary changeover to low-sulfur fuel can be applied to abate SO2 emissions from oil-fueled power plants. Certain pollutants, primarily SO2, can be neutralized prior to discharge by means of ammonia or dolomite injections in respective amounts of 1-2 kg and about 0.5 kg/ton of fuel oil. A pilot plant using ammonia as an additive and recovering the SO2 has been built. Improving the dispersion of the pollutants is another means of pollution control. High stacks of 110 to 240 m providing a discharge rate of 12-20 m/sec should be erected for power plants with capacities of 125-600 MW. Shutting down obsolete plants and improving separation techniques resulted in a decrease in dust emissions from 9 g/kWh in 1959 to 1 g/kWh in 1969 at coal-firing power plants, and slight reduction in SO2 emissions despite sharply increased plant capacity was observed. Present research centers on fuel oil desulfurization, sulfur removal from waste gases, dispersion studies, and investigations of nitrogen oxide emissions. Potential radioactive pollutants from nuclear power plants (air, carbon dioxide, nitrogen, hydrogen, CO, iron, chromium, sodium, and uranium) as well as control measures are reviewed. The radioactive pollution level at nuclear power plant sites corresponds to a value less than 10 Ci/GWh, which equals the background level.

23272 APTIC NO. 43582

Roberts, A. G., J. E. Stantan, and D. M. Wilkins

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSION OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED BED COMBUSTION OF COAL. APPENDIX 2. EXPERIMENTS WITH THE 48 IN BY 24 IN PRESSURIZED COMBUSTOR. (TASK II). *National Coal Board, London (England), Fluidised Combustion Control Group, Office of Air Programs APTD-1083, Rept. DHB 060971, 192p., Sept. 1971. 8 refs.*

NTIS: PB 210674

A 48-by-24 inch pressurized combustor for fluidized bed combustion of coal was tested to obtain data for operation under pressure on effects of operating variables on emissions of sulfur oxides and nitrogen oxides and on the corrosion/deposition of boiler metal and turbine blade specimens. Plant design and dimensions, instrumentation, and general operating procedures are reviewed. The main variables investigated were calcium/sulfur ratio, type of additive, and size of additive and coal. Fluidizing velocity and bed depth and temperature were substantially constant at 1.9 ft/sec, 3.75 ft, and 1470 F, respectively; operating pressure was 3.5 or 5 atm absolute. Reduction was not affected by pressure in the range 3.5-5 atm or by altering the median size of the additive from 1100 to 400 micron. Reduction did vary somewhat with type of dolomite used as additive and was surprisingly high with limestone 18 in view of the fact that limestone did not calcine at these conditions. Emission of SO2 fluctuated in sympathy with the coal feed rate. None of the variables affected NOx emissions which were generally in the range 80-190 ppm. Particulate emissions varied with type of coal and additive. Data on combustion efficiency, temperature distribution, and corrosion/deposition effects are presented. (Author summary modified)

23273 APTIC NO. 43382

Robison, E. B., R. D. Glenn, S. Ehrlich, J. W. Bishop, and J. S. Gordon

STUDY OF CHARACTERIZATION AND CONTROL OF AIR POLLUTANTS FROM A FLUIDIZED-BED COMBUSTION UNIT. THE CARBON-BURNUP CELL. *Pope, Evans and Robbins, Inc., Office of Air Programs Contract CPA 70-10, APTD-1170, 233p., Feb. 1972. 25 refs.*

NTIS: PB 210828

The injection of finely divided limestone into a coal-burning fluidized bed operating at 1500-1600 F and with about 3% residual oxygen in the flue gas markedly reduced sulfur oxide emissions from a fluidized bed boiler. With 3% residual oxygen in the flue gas, however, an economically unacceptable fraction of the input coal fuel value would be lost as carbon in the fly ash blown out of the furnace. The carbon burnup cell is investigated as a feasible solution to the problem of fuel loss. The carbon burnup cell is a region of a fluidized bed boiler in which the fuel is the carbon bearing fly ash carried out of the adjacent coal burning regions of the boiler. Complete data on design criteria, instrumentation, materials, statistical design of experiments, models, emissions of nitric oxide, sulfur dioxide, particulates, hydrocarbon, and carbon monoxide, and operating variables are reviewed. The feasibility of a coal-fired fluidized bed boiler for operation at relatively high air rates and over 99% combustion efficiency was demonstrated. The requirements for bed depth, firing rate, and air rate for the carbon burnup cell were determined using the performance model. Fuel costs are minimized when the boiler is designed and operated so that approximately 90% of the fuel value is consumed in the primary cells and 10% in the carbon burnup cell. (Author summary modified)

23274 APTIC NO. 42460

Roche, J. P.

FLY ASH CONCRETE IN BUILDINGS IN CHICAGO. *Bureau of Mines Information Circ., no. 8488:19-33, 1970. (Presented at the Ash Utilization Symposium, 2nd, Pittsburgh, Pa., March 10-11, 1970.)*

Utilization of fly-ash wastes in concrete mixes is a way of converting a principal air and water pollutant to a useful product. Several construction projects in which fly ash containing cement mix was used are reviewed. Fly ash has been found to contribute greatly to watertightness and workability. The most satisfactory results were obtained with a combination of fly ash, Pozzolith, and air; 72-75 lbs fly ash/cu yd were generally specified.

23275 APTIC NO. 43381

Rossin, A. David and John J. Roberts

EPISODE CONTROL CRITERIA AND STRATEGY FOR CARBON MONOXIDE. *J. Air Pollution Control Assoc., 22(4):254-259, April 1972. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 1971, Paper 71-55.)*

Forecast is a key factor in the approach to carbon monoxide episode control. Criteria are established and control actions can be taken to prevent substantial endangerment to the health of the population. Health effects from CO are related to the level of carboxyhemoglobin in the blood. A graph predicts COHb levels as a function of CO concentration and exposure time. The graph has lines at 7%, 4.5%, and 3.7% COHb. Forecasts are made, taking into account meteorology, predictable traffic density variation, and effective exposure time for the population. Each monitor is assigned an effective exposure time, for example, school: 8 hr; residential: continuous; expressway: one half hour. The time can be extended in the event of a traffic jam, but the forecaster cannot shorten it. If the forecast exceeds 3.7% COHb, a watch is put into effect. If the forecast exceeds 4.5% COHb, a CO alert is declared. A 7% COHb forecast calls for an emergency. The location, traffic situation, and severity are evaluated and control actions initiated, such as: mitigating the effects of local traffic jams, prohibiting engines left idling at curbsides, and rerouting traffic. Plans should be prepared in advance to restrict traffic to authorized vehicles only in the event of an emergency.

23276 APTIC NO. 42311

Rudolph, Paul

THE LURGI PRESSURE GASIFICATION PRECEDING COMBINED POWER PLANT PROCESSES. *(Die Lurgi-Druckvergasung als Vorschaltprozess fuer kombinierte Kraftwerksprozesse). Text in German. Preprint, 18p., 1971. (Presented at the Technische Moeglichkeiten zur Entschwefelung von Brennstoffen und Abgasen, Essen, West Germany, Nov. 11, 1971.)*

The Lurgi coal pressure gasification preceding combined power plant processes is described. The gasification is made in steam and air counterflow, the air required is 25% of the necessary combustion air. The granular ash contains 3-5% of unburned matter, while the gas contains 12.2% by volume of carbon dioxide, 13.7% carbon monoxide, 21.6% hydrogen, 4.3% methane, 13.0% water, 34.8% nitrogen, 0.4% hydrogen sulfide, and tar and other condensates. The net calorific power lies at 1340 kcal/N cu m. The gas, leaving the gasifying equipment under 20 at pressure and at a temperature of 350-600 C, contains no dust, alkali, chlorine, or fluorine. To remove the H2S content, selective potash scrubbing at 100 C combined with desorption under atmospheric pressure and water vapor stripping is applied. Some 90-95% of the H2S and about 10-20% of CO2 are removed, and the former can be converted into elementary sulfur or sulfuric acid. Combined power plant processes, with a thermal efficiency of 36%, include such stages as coal gasification, intermediate expansion to conventional gas turbine pressure, nearly stoichiometric combustion in a pressurized combustion chamber combined with steam boiler, gas turbine with an admission temperature of 820 C, heat exchanger system designed to preheat feed water, and a steam turbine. The nitric oxide emissions are low due to the low combustion temperature. Such combined power plants are less expensive than conventional ones due to investments being lower and increased thermal efficiency. The sulfur emissions are 1.2-1.5 kg of sulfur dioxide per Gcal of coal.

23277 APTIC NO. 42886

Ruof, C. H., N. V. Messina, H. J. Gibson, R. A. Sholts, H. Ikeda, H. Minamidani, T. Mori, E. Jo, N. Yamaki, T. Iida, H. Katayama, M. W. Munsell, J. H. Blakney, L. E. Coleman, M. T. White, Jr., T. Nishihara, N. Watanabe, T. Saito, T. Sakurai, R. Hirokawa, and M. Ishimaru

CONTRIBUTION OF FUELS AND LUBRICANTS TO AUTOMOTIVE EMISSIONS REDUCTION. *(Jidosha no haiki kogai boshi taisaku to nenryo junkatsuyu). Text in Japanese. Sekiyu Gakkai-shi (J. Japan Petroleum Inst., Tokyo), 15(4):256-261, April 1972.*

The contribution of fuels and lubricants to automotive emission control is discussed. The major topics include new trends in oil and gasoline classifications with respect to antiknock and emission performance; poisoning of catalytic emission control devices by minimal amounts of lead; the effects of lead additives in gasoline and of sludge dispersants in lubricating oil on octane requirement increase; unleaded gasoline and engine cleanliness; engine oil temperature and antipollution devices; exhaust gas recycling; and future trends in sludge dispersant levels.

23278 APTIC NO. 43413

Sacks, Newton N.

AIR POLLUTION CONTROL AT THE DEERE FOUNDRIES. *Preprint, American Inst. of Chemical Engineers, New York, 11p., 1971. (Presented at the American Institute of Chemical Engineers, National Meeting, 69th, Cincinnati, Ohio, May 18, 1971.)*

Air pollution control activities at the John Deere foundries since the 1920 s are reviewed, and the control procedures employed at a new foundry at East Moline, Illinois are described. The dust collection for the melt department is divided into three systems, each with its own collector and fan. Each of the two pairs of electric melt furnaces is served by a system exhausting 100,000 cu ft/min through 420 stocking type dacron bags with mechanical shaking. The magnesium treatment stations are served by a system integrated with the major system, exhausting 25,000 cu ft/min through 140 dacron bags. They are modularized into 14 sections dampered to permit continuous operation and discharging into conveyers that transport the collected dust to a storage hopper which, in turn, feeds through a pelletizing unit that permits disposal of the collected dust without a secondary dust problem. The many exhausts of the molding department are served by 13 Schneible Multi-Wash collectors. The core knockout and casting, cleaning, and grinding departments are served by five Centri-Spray Wet Spray Type collectors. Pneumatic transport for the bond storage and blending facilities is served by a group of Micro Pulsaire Dust Collector Units having wool felt filter cylinders and reverse compressed air jet cleaning in a timed cycle. A complex water clarifying system permits the recycling of water to conserve water, in addition to providing an acceptable effluent to be discharged. Specifications being developed for cupola control installation are outlined.

23279 APTIC NO. 42636

Saito, Hiroshi and Yoshioki Araki

AIR CLEANER. *(Kuki seijo sochi). Text in Japanese. (Mitsubishi Electric Appliances Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 47-7353. 2p., March 17, 1972. (Appl. April 2, 1969, 1 claim).*

This air cleaner is designed to eliminate dust and toxic gases simultaneously and efficiently by the use of double filters. In the roll-sheet type filter air cleaner, the supplies of two filter materials are stored in the storage space at the top, folded in an accordion pleat form. One filter, the dust filter, is rolled out vertically, perpendicular to the flow of the air current, and the other filter for toxic gas is rolled on the rack installed in a zigzag course. However, in the environments where the concentration of dust is higher than that of toxic gases, the positions of the filters may be exchanged and the toxic gas filter can be moved perpendicularly and the dust filter may be rolled on the zigzag course.

23280 APTIC NO. 42710

Sakai, Kanji, Noboru Nakatsuji, and Toshihiko Inoue

TESTS ON AIR PURIFIERS. *(Kuki seijoki no shiken). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):76, 1969. (Presented at the Japan Society of Air Pollution, Annual Meeting, 10th, Tokyo, Japan, 1969, Paper 75.)*

Various types of air cleaners (one electrostatic precipitator and two filters) were tested and sulfur oxides and suspended particulate residues were measured to determine their performance rates. Sulfur oxides were checked by the electroconductivity test method and by the alkaline filter paper method, and suspended particulates were checked by a portable digital dust counter. The large filter air cleaner reduced SOx from 0.13 ppm to 0.06 ppm in 20 min. The cleaning rate was approximately 88%. The smaller filter showed a similar efficiency, but the collection rate of the electrostatic precipitator was 71%, possibly due to the lower concentration of SOx in the air. Suspended particulates were reduced from 1.0 mg/cu m to 0.2 mg/cu m in approximately 20 min. The dust collection rates were between 88 to 92%.

23281 APTIC NO. 42615

Sasaji, Shojiro

CATTLE AND POULTRY EXCRETA DRYER EXHAUST DEODORIZATION METHOD. *(Kachiku, kakin nado no funnyo sonota no obutsurui no neppu kanso ni yoru haiki gasu shoshu haihosan hoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-10841. 6p., March 31, 1972. (Appl. Aug. 5, 1969, 1 claim).*

This is a method of deodorizing the emission gas from the dryer of cattle and poultry excreta by the use of several dispersion chambers. The odorous gas is led into the first dispersion room which is a low, concrete structure of about 35 to 40 cm high, and is a part of the entire dispersion structure. The gas is dispersed in this chamber and enters the second dispersion chamber, which is a larger section of the dispersion structure partitioned off from the first dispersion chamber by a number of concrete walls with holes. The concrete wall segments are not completely sealed off, so that the gas can enter into the second chamber through the gaps as well as through the holes of the wall. The second chamber is partitioned into a number of paralleling long chambers by segmented concrete walls. Here, the gas comes in contact with porous soil on the ground. Deodorizer or odor neutralizer can be applied on the soil so that absorption will be more effective. Steam will be liquidized, and dust will be precipitated. At the other end of the long segmented chambers is the outer wall of the dispersion structure which has many holes close to the ground. The diluted and deodorized gas is emitted from the holes. The porous soil in the second dispersion chambers can be dug up or exchanged with new porous soil from time to time.

23282 APTIC NO. 42650

Sato, Takao

AIR CLEANER. *(Kuki seijoki). Text in Japanese. (Yamaha Motors Co., Ltd. (Japan)) Japan. Pat. Sho 47-9420. 2p., April 10, 1972. (Appl. July 28, 1970, 1 claim).*

This utility model is an air cleaner for cars which will require complete dryness. It is designed to prevent the infiltration of rainwater or water from a car wash into the mechanism. The cleaner case is made of plastic and an outlet at the lower side is connected with the carburetor. The brim of the cleaner case is channeled and has a drainage hole at the bottom. The cover of the cleaner case is also made of plastic, and it has edges that interlock with the drainage channel of the case. The channel on the cover is packed with an absorbent material. A dry filtering mechanism is placed in the case, and the top and the bottom are protected by soap sponge or some other type of elastic, absorbent material. The filter is stabilized in the case with bolts and nuts. Polluted air enters from a pipe attached on the side, goes through the filter element, and leaves from the outlet at the bottom.

23283 APTIC NO. 42825

Schadow, K.

STUDY OF GASEOUS NONEQUILIBRIUM EFFECTS IN PARTICLE-LADEN, DUCTED FLOWS FOR IMPROVEMENT OF THE COMBUSTION EFFICIENCY. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 10p., 1972. 5 refs. (Presented at the American Institute of Aeronautics and Astronautics Aerospace Sciences Meeting, 10th, San Diego, Calif., Jan. 17-19, 1972, Paper 72-36.)*

The reaction of a particle-laden plume with a ducted subsonic airstream was experimentally studied by burning boron-containing solid propellants and exhausting the products into a fuel-air combustion chamber. The observed reduced boron combustion efficiency with decreasing afterburner pressure was attributed to not achieving intensive reaction between the excess gaseous fuel from the solid propellant motor and the oxygen of the incoming air in the beginning of the mixing process. Because this reaction did not occur at all or started downstream in regions where intense mixing with the relative cool air had already taken place, the boron, particles were not heated to a temperature where self sustained particle combustion could occur. (Author abstract)

23284 APTIC NO. 42853

Schadt, H. F.

FUME INCINERATION HEAT RECOVERY CUTS POLLUTION CONTROL COST. *Heating, Piping, Air Conditioning, 44(7):79-80, July 1972.*

High efficiency heat recovery systems which are built into incinerators have been developed in the last few years. These systems take a variety of forms, including air-to-air exchangers used to heat exhaust prior to its entry into an incinerator, and air-to-liquid systems designed to recover waste for use in metal preparation operations, in heating ovens, and for heating plant makeup air. One of the most recent major systems of the liquid heat recovery type is in installation on a new coil coating line at Peotone, Ill. This is a high pressure hot water heat recovery system operated in conjunction with two solvent fume incinerators. Design data, controls, and safety features of this installation are indicated.

23285 APTIC NO. 42955

Schmidt, Walter A. and Carl R. Flodin

FUNDAMENTAL PRINCIPLES, DESIGN, APPLICATION, PERFORMANCE, AND LIMITATIONS OF ELECTRICAL PRECIPITATION EQUIPMENT. *Interdepartmental Committee on Air Pollution, Washington, D. C., Air Pollut., Proc. U. S. Tech. Conf., Washington, D. C., 1950, p. 373-381. 3 refs. (May 3-5, Louis C. McCabe, ed.)*

The four main functional parts of a precipitator installation are: a source of high voltage; high-voltage ionizing electrodes and collecting electrodes; a medium for disposing of the collected material; and an outer housing. The difference between single-stage and two-stage precipitators is noted. Physically, precipitators may be either pipe-type or plate-type. Design factors include proportioning, capacity, electrode cleaning, component reliability, stability of electrode systems, accessibility for maintenance, gas flow control, control of erosion of dust from electrodes, and an adequate and reliable source of high-voltage ionizing potential and current. The wide variety of industrial applications is described. Although collection efficiencies of up to almost 100% are possible, cost, space, and other considerations usually dictate practical efficiencies of 75-99%. Comparative costs depend in part on the characteristics of the dust and the temperature of the gases; examples are given. Limitations of precipitators in collecting vaporized materials and in handling inlet dust loadings greater than 25 grains per cubic foot of gas or less than about 0.5 grain are discussed.

23286 APTIC NO. 43502

Schuetz, H.

SUCTION HOODS AND PIPING - IMPORTANT COMPONENTS OF DUST SEPARATORS. *(Absaughauben und Rohrleitungen - wichtige Bauelemente einer Entstaubungsanlage). Text in German. Blech, 18(9):381-388, Sept. 1971.*

Suction hoods and piping as used for dust separators and related design criteria are described. Suction openings should be placed as close as possible to dust emission sources, and suction hoods should be adopted to the specific sources. The suction efficiency may be influenced by air displacement and thermal lift. Full enclosure of emission sources and movable suction heads are best, while lateral exhaust, necessary in several cases, is less effective. Pressure losses occurring in pipes due to dynamic and friction losses are described. Pipes elbows should have radii twice the pipe diameter. The volume of infiltrated air due to elbow slots accounts for about 10% of the total gas volume carried in pipes of small diameter. Pipe branching angles above 30 degrees and threefold branches should be avoided. Diffusors may have a maximum angle of 10 degrees, and ventilators should be provided with straight connections. A minimum of three changes of air/hr should be provided for, and relatively tight locals should obtain fresh air. Cleaned air should be only recirculated if it is free from any harmful pollutant.

23287 APTIC NO. 42313

Schulz, Werner

THE GRILLO-AGS-DESULFURIZATION METHOD. *(Das Grillo-AGS- Entschwefelungs verfahren). Text in German. Energiewirtschaft. Tagesfrange, no. 3/4, 2p., 1971.*

The Grillo-AGS method, developed for the selective desulfurization of waste gases, is described. The sulfur dioxide is absorbed by the aqueous suspension of a mixture of magnesium and manganese oxides to which pyrolusite as a promoter is added, at a contact time less than 1 sec. The aqueous suspension is recirculated in the absorbing towers which latter are designed for a capacity of about 220,000 cu m each. The spent suspension is dried in spray driers to be sent to a large-capacity, central regenerating plant for the regeneration of both the absorbent and the absorbed sulfur content. The regeneration is made in a fluidized-bed roasting oven with fuel oil, coal, or gas as reducing agent. The sulfate is here reduced to sulfite, and SO2 as well as alkaline oxides are formed at a temperature of about 900 C. The roasting gas contains 5-7% SO2, thus is suitable for sulfuric acid production. Compact absorber design due to the high reaction rate and relatively low running costs are the basic advantages involved in this recycling method. Some 20 million tons of SO2 will have to be removed from waste gases yearly in West Germany over the next 20 years.

23288 APTIC NO. 43333

Schwing, Richard C.

THE EFFECTS OF TEL ON OXIDATION IN AN EXHAUST MANIFOLD REACTOR: A SINGLE-CYLINDER ENGINE STUDY. *Preprint, Society of Automotive Engineers, Inc., New York, 14p., 1971. (Presented at the Society for Automotive Engineers, National Combined Fuels and Lubricants, Powerplant and Truck Meetings, St. Louis, Mo., Oct. 26-29, 1971, Paper 710844.)*

In rich-exhaust manifold reactors, complete oxidation of carbon monoxide and hydrocarbons, generally characterized by luminous conditions and high temperatures, is desirable. Some of the conditions necessary for luminous oxidation in an insulated exhaust reactor have been explored with a single-cylinder engine using both leaded and unleaded isooctane. Tetraethyl lead inhibits slow oxidation reactions. Threshold-reactor air-injection rates required for luminous oxidation in the reactor were determined for engine air-fuel ratios between 11.2 and 14.1. Leaded isooctane produced higher unburned HC concentrations in the exhaust than unleaded isooctane when injection air was introduced as well as when no air was added. In addition, oxidation of CO in the reactor was hindered in the tests with leaded isooctane. During one set of experiments, conditions were such that luminous oxidation in the reactor was achieved with the unleaded fuel, but was not achieved with the leaded fuel. In warmup studies, a longer time was required to reach luminous conditions in the reactor when leaded isooctane was used in the engine than when unleaded isooctane was used.

23289 APTIC NO. 43611

Segerfelt, Bror Natanael

PROCESS FOR THE REMOVAL OF MALODOROUS GASES PRODUCED IN SULFATE AND SODA PULP MANUFACTURING PROCESSES. *(Procede pour l elimination des gaz malodorants produits dans la fabrication de la cellulose au sulfate et de la cellulose a la soude). Text in French. (Assignee not given.) French Pat. 687,335. 7p., April 28, 1930. (Appl. Dec. 27, 1929, 2 claims).*

A process for the removal of malodorous gases formed during the sulfate or soda pulp processes is described. The gases are cooled to dew point or saturated with water and treated with agents capable of oxidizing, absorbing, or combining with the malodorous constituents. The treatment is made at a maximum gas flow rate of 0.5 m/sec and under a pressure nearly equal to the atmospheric pressure in a temperature range of 20-120 C. The absorption is made in a series of absorbers containing water and alkaline solutions, preferably of fresh liquor to which hydrocarbons of the terpene or camphor groups are added. Combustible gases are burned and then mixed to the rest prior to the above treatment. Gases produced during cooking and extraction and released from digesters are purified by absorption in high-viscosity alkaline liquor solutions prior to combustion.

CONTROL METHODS

23290 APTIC NO. 43454

Shak, B. J.

ATMOSPHERIC CORROSION OF STRUCTURAL STEEL AND ITS CONTROL. *Plant. Eng. (London), 15(3):18-25, March 1971. 12 refs.*

Basic principles of the mechanisms of electrochemical corrosion of steel, its effects on the environment, and the measures taken o prevent corrosion, with special attention to design and surface preparation, are discussed. Corrosion studies have two objectives: to determine circumstances and rates at which metal is attacked and the characteristics of corrosion, and to determine the technical and economical feasibility of various control or prevention measures. These measures may be metallurgical (e.g., changes in composition and/or microstructure), physical (e.g., application of surface coatings to form a barrier between steel and environment), electrochemical (e.g., cathodic protection), or a combination of these methods. Factors affecting the methods are material specification, equipment design, surface preparation, method of application of coatings, and inspection and maintenance. Special attention is devoted to design and surface preparation. Design has to be simple, avoiding features that trap moisture or dirt; crevices should be closed by welding or filling; drainage holes should be provided. Joints and fasteners should be arranged to give clean uninterrupted lines. More resistent coating should be applied on higher-condensation areas. More resistent coating should be applied on higher-condensation areas. More rounded countours are recommended for sharp edges and corners. Under-rusting should be avoided by proper surface preparation. Removal of scale by pickling or blast-cleaning, followed by immediate application of new paint, is recommended. The main problem facing the designer and engineer is not a shortage of preventive methods but one of obtaining optimum protection for money expended. Factors directly influencing the choice of a protective system are environment of exposure and the proposed periods between maintenance. (Author conclusions modified)

23291 APTIC NO. 43406

Shaw, F. M.

EMISSIONS FROM CUPOLAS. *Foundry Trade J. (London), 100(2063):217- 227, Aug. 30, 1956. 39 refs. (Presented at the Institute of British Foundrymen, Annual Conference, Cardiff, Great Britain, June 1956.)*

Problems posed by emissions from foundry cupolas in Great Britain are presented, and recommendations for utilization of air-pollution control equipment are made. Cupolas in the United Kingdom emit some 40,000 ton/yr of solid matter; the stack gases carrying these solids are fairly large in volume, hot, and potentially corrosive. Various types of dust-collectors have been utilized, or suggested for utilization, on cupolas. The most popular type (consisting of an expansion chamber and baffle) is very inefficient, and collects only the heaviest particles. To obtain collection efficiencies of over 70% (by weight) fairly expensive equipment is needed. For efficiencies of over 90%, very elaborate and expensive collectors must be utilized, e.g., electrostatic precipitators or bag filters. The simple baffle and water-spray type of collector removes about half of the dust in stack gases and offers the cheapest means of achieving a reasonable degree of cleaning. The particles escaping this type of collector are fairly small and unlikely to constitute a nuisance. Because of its small particle size cupola fume can only be removed by the most efficient collectors. Smoke from dirty scrap, consisting of even smaller particles, is correspondingly more difficult to remove, but may be minimized by ensuring complete combustion of the stack gases. Of the gases present in the stack, only two are of importance. Carbon monoxide, because of its toxic nature, must be burned to harmless carbon dioxide or kept well clear of operators. Sulfur dioxide, present in small quantities, can cause rapid corrosion of steelwork in the presence of moisture. (Author abstract)

23292 APTIC NO. 43345

Shigetomi, Toshiya

THE LODGE TYPE ELECTROSTATIC PRECIPITATOR. *(Rojji shiki denki shujin sochi ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 39(3):17-24, March, 1972.*

Two control systems for gas flow are equipped in a lodge type electrostatic precipitator, one at the mouthpiece and the other at the entrance of the dust collector. The discharging pole of this electrostatic precipitator is called a mast type in which discharging wire is attached to a supporting rod which is fixed in a steel pipe. This has the following advantages: less vibration during the operation due to the shorter span for discharging wire; the linearity of the discharging wire does not result from the strong tension of the wire; the striking power is effectively transferred to the entire discharging wire from the top of the mast and the removal of dust is very effective. A catch space type dust collecting electrode has a homogeneous electric field and is able to prevent re-scattering of the dusts. A spark detecting type automatic control system is used.

23293 APTIC NO. 43361

Shimizu, Hiroshi

AIR CLEANER WITH A SUCTION AIR TEMPERATURE CONTROL DEVICE. *(Kyuki ondo seigyo sochi tsuki kuki seijoki). Text in Japanese. (Nissan Automobile Co., Ltd. (Japan)) Japan. Pat. Sho 47-10566. 2p., April 19, 1972. (Appl. May 26, 1967, 1 claim).*

This utility model is designed to increase the stabilization of the engine by controlling the temperature of the suction air in the air cleaner. In this way when the engine suction air is small, heated air will be supplied, and when the suction amount is large, unheated air will be supplied. The device consists of an air cleaner, its suction pipe, a branch suction pipe, carbureter and its throttle valve, a throttle valve shaft, and exhaust branch pipes. The opening of the branch suction pipe is led to an area near the exhaust branch pipe, and it is connected with a cover of the exhaust. The branching point of the suction pipe and branch suction pipe has a change-over valve which can rotate freely by a shaft. This shaft and the shaft of the throttle valve are linked together, and when the opening of the throttle valve is small, the change-over valve opening closes the suction pipe; when the opening of the throttle valve is large, the change-over valve closes the branch suction pipe. The air in this branch pipe is warmed because it is placed near the exhaust branch pipe, and the air sucked in by the pipe is heated.

23294 APTIC NO. 42673

Shimokawa, Yoshiharu

UTILIZATION OF ASPHALT AND DESERT DEVELOPMENT. *Chem. Economy Eng. Rev., 4(5):38-41, May 1972.*

The Desert Development Institute was set up in Japan with the aim of promoting research and development work on agriculture in arid regions as well as providing economic aid to developing countries. In 1971, with the support of Tokyo University, research work was conducted on the laying of waterproof asphalt layers in the ground for agricultural purposes. Of the 220 million kiloliters of crude oil Japan buys from abroad, about 20% or 40 million kiloliters are asphalt; the sulfur content i the asphalt is about 5-6%. Asphalt as a pollutant and the use of crude oil containing a high level of sulfur and asphalt are considered. Projects of the Desert Development Institute are indicated. Salts, securing a water supply, improving alkaline soil, and fertilizer shortages are discussed as they pertain to agricultural development in desert areas.

23295 *APTIC NO. 42637*

Shinobiashi, Yoshimi

MATERIAL FOR FILTERING GASES. (Kitai rokazai). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-7354. 2p., March 17, 1972. (Appl. April 21, 1969, 1 claim).

The invention is designed to improve the efficiency of gas filter materials made of cloth or metal mesh on which hairs (fuzz) are planted. Ordinarily, 1 to 2 mm hairs are planted vertically on the mesh surface, perpendicular to the surface. Such filter materials have an advantage of brushing off easily, but their dust collection rate is extremely low. The rate is approximately 2% at the air flow speed of 2 m/sec, for 0.3 micron dusts. By planting the hair in a certain angle, the dust collection rate is greatly improved. As the angle of slanting increases, the collection efficiency improves. However, when inclination is more than 45 degrees, the pressure loss suddenly increases. Therefore, in actual use, the inclination of hair against the mesh surface should be approximately 45 degrees.

23296 APTIC NO. 43344

Shinobiashi, Yoshimi

ELECTROSTATIC PRECIPITATOR. *(Denki shujinki). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-1183. 4p., Jan. 17, 1972. (Appl. July 26, 1968, 1 claim).*

An improved electrostatic precipitator has brushes to clean both the earthed electrode of the ionization part and the electrode of the dust collecting part. The dusts brushed out from the electrodes are then collected with a filtering belt. The filtering belt consists of a part with a small air passing resistance material such as a metal net, and a filtering part. When dusts on the electrodes are being brushed, the filtering part of the belt is rolled up to face the air flow path, and when it is not brushing, the part of small resistance is rolled down to face the air path. When material of about 5 mm Aq pressure drop is used for the part with small resistance, the best air diffusion can be obtained.

23297 APTIC NO. 42880

Shklyar, R. L., Yu. V. Akselrod, and R. M. Milogradova

REMOVAL OF CARBON DIOXIDE AND HYDROGEN SULFIDE FROM NATURAL GAS USING AQUEOUS SOLUTIONS OF DIETHANOLAMINE. *(Ochistka prirodnogo gaza ot CO2 i H2S vodnymi rastvorami dietanolamina). Text in Russian. Gaz. Prom., 17(1):39-45, 1972. 17 refs.*

The absorption rates of hydrogen sulfide in water and in aqueous monoethanolamine and diethanolamine and of carbon monoxide in aqueous diethanolamine were measured. Equations were derived for CO2 and H2S concentrations equaling or exceeding 95% in the gaseous phase. Good accordance between experimental and theoretical values was observed. The absorption rate for H2S was totally controlled by the resistance in the gaseous phase, while that for CO2 was controlled by the total resistance of both phases. Diethanolamine was superior to monoethanolamine regarding the selective absorption of H2S from natural gas. The selectivity coefficients of diethanolamine and monoethanolamine solutions were 3.585 and 2.133, respectively, with a ratio of about 1.7. Monoethanolamine was a more effective absorbent for CO2 than diethanolamine.

23298 APTIC NO. 43551

Silverman, Leslie

FILTRATION THROUGH POROUS MATERIALS. *Ind. Hyg. Q., 11(1):11-20, March 1950. 11 refs.*

Fundamentals, requirements, and operating characteristics are presented of filters applied to the cleaning of air and gases discharged from industrial processes. Filtration of aerosols can be accomplished by two distinct methods. In one, the media acts as the separator and for this purpose the composition and nature of the filter are important. In the second type, the media acts primarily as a reasonable high efficiency filter which provides a means of building up a supporting bed of aerosol particles. The major portion of the particulate matter to be separated is removed by the layer or bed formed on the media surface. Filtration materials are discussed, including their efficiency and filter media life. Important characteristics of the aerosol to be filtered include particle size and shape, specific gravity, particle surface characteristics, packing characteristics, gas density and viscosity. Filter resistance is considered. Air conditioning and other filter applications are discussed.

23299 APTIC NO. 43421

Simonnot, Rinuy and Santarelli

AFTERBURNER FOR INTERNAL COMBUSTION ENGINES. *(Dispositif de post-combustion pour moteurs a combustion interne). Text in French. (APPCA Inc., Md.) French Pat. 2,051,276. 12p., March 22, 1971. (Appl. June 24, 1970, 10 claims).*

The combination afterburner and silencer described preheats secondary air which, mixed with exhaust gases from internal combustion engines, permits their ignition and sustains the secondary combustion of hydrocarbons and of carbon monoxide emitted by the engine. The preheating of secondary air is accomplished by a helicoid pipe between the outer mantle and the body of the afterburner and by a system of tubular baffles reversing air flow inside the body. The heated air is divided into several flows which are introduced into the body of the afterburner at axially spaced intervals with one flow emptying directly into the combustion chamber. The cup-shaped combustion chamber situated coaxially with the exhaust gas inlet in the interior of the afterburner is provided with a device which periodically ignites a volume of stagnant gas-air mixture. The post-combustion gas is deflected towards the tubular wall of the interior body which conducts the heat to the secondary air flowing through the spiral tube between the inner body of the afterburner and the mantle.

23300 APTIC NO. 43372

Singh, P. P., W. E. Young, and M. J. Ambrose

FORMATION AND CONTROL OF OXIDES OF NITROGEN EMISSIONS FROM GAS TURBINE COMBUSTION SYSTEMS. *Preprint, American Society of Mechanical Engineers, New York, 8p., 1972. 18 refs. (Presented at the American Society of Mechanical Engineers Gas Turbine and Fluids Engineering Conference and Products Show, San Francisco, Calif., March 26-30, 1972, Paper 72-GT-22.)*

Levels of nitrogen oxides emitted in gas turbine exhausts and techniques for controlling the amounts of these emissions were investigated. Approximate NOx levels of gas turbine combustors were 180 ppm at peak loads using oil as a fuel. Smaller combustors at lower pressures yielded 85 ppm with oil and about 65 ppm with gas at equivalent temperature rises. Simple modifications to reduce NOx emissions using either gas or oil included lowering the flame temperature by primary zone leaning; reducing the flame residence time by moving secondary diluent holes upstream; or recirculating a portion of the cooled exhaust products. Primary zone leaning and exhaust gas recirculation also reduced carbon monoxide, hydrocarbon, and smoke emissions. For 85% reduction of NOx levels, direct water injection into the combustor primary zone was effective and was accompanied by smoke reduction and power increase. Adding steam to the combustion air also reduced NOx levels up to 85% and did not affect smoke emission but increased the levels of CO and hydrocarbon emissions. (Author summary modified)

23301 APTIC NO. 43613

Skopp, A., M. S. Nutkis, G. A. Hammons, and R. R. Bertrand

STUDIES OF THE FLUIDIZED LIME-BED COAL COMBUSITON DESULFURIZATION SYSTEM. (FINAL REPORT). *Esso Research and Engineering Co., Linden, N. J., Government Research Div., Office of Air Programs Contract CPA 70-19, 118p., Dec. 1971. 7 refs.*

NTIS: PB 210246

A two phase program was carried out to further the development of fluidized bed combustion of coal as a new, low polluting boiler technique for use in electric power plants. In fluidized bed combustion, the coal is burned in a bed of solids kept fluidized by the combustion air and the resulting flue gas. Combustion temperature is typically controlled between 1500-1700 F by locating a steam raising surface in the bed and taking advantage of the excellent heat transfer characteristics and high heat capacity of the fluidized solids. Greater than 90% reduction in sulfur dioxide emissions can be achieved by using calcined limestone as the bed material. The first phase of the program involved the development of a detailed design for a continuous fluidized bed combustion lime regeneration pilot unit. The second phase of the program involved a study of the factors influencing the formation and the control of nitrogen oxides in fluidized bed combustion.

23302 APTIC NO. 42369

Slack, A. V. and R. E. Harrington

REMOVAL OF SULFUR DIOXIDE FROM POWER PLANT STACK GAS: STATUS OF LIMESTONE PROCESSES. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 757-763. 5 refs. (Dec. 6-11, Paper EN 23B.)*

The problems in developing the technology concerning the removal of sulfur dioxide from power plant stack gas by use of limestone processes (both wet and dry systems) are discussed. Two types of the dry system exist: injection into the boiler furnace whereby calcination to calcium oxide takes place almost instantaneously; sulfur dioxide is absorbed to form calcium sulfate; and the ash, unreacted calcium oxides, and product calcium sulfate are removed together in dust collection equipment. The method is simple and low in cost, but removal efficiency is low. The second dry method; addition of limestone ($CaCO_3$) to alkali sulfite solution (e.g., sodium or ammonium sulfite) outside the scrubbing circuit to precipitate calcium sulfite and regenerate the alkali for return to the scrubber. The more efficient alkali absorber should make it possible to reduce scrubber size and liquor pumping rate and the high solubility of the alkali sulfite should prevent scaling problems but, almost complete recovery of alkali in the precipitation step would be essential. Of the wet systems, injection into the boiler followed by passing the gas stream through a wet scrubber (washer) at the end of the system is the most efficient, but costs are high due to the scrubber. Introduction of lime (CaO) into a wet scrubber system (rather than into the boiler) is an expensive method but certain operating problems are avoided. Introduction of limestone ($CaCO_3$) into a wet scrubber system is the least expensive but $CaCO_3$ is not as effective an absorbent as CO. Also reported are various research and development programs.

23303 APTIC NO. 43505

Smith, Kenneth M.

HOW TO MAINTAIN FOUNDRY VENTILATION AND DUST COLLECTING SYSTEMS. *Trans. Am. Foundrymen s Soc., voi 60:485-496, 1952.*

Maintenance for the following ventilation and dust collecting systems is described: fans, ducts, hoods, air heaters, and dust collectors, including cloth type dust collectors, felt tube dust collectors, dry cyclones and multiple cyclones, dry rotary centrifugal collectors, wet type dust collectors, wet cyclone collectors, sludge settling tanks, and wet rotary centrifugal collectors. In all systems, enough room should be provided for convenient installation, cleaning, or removal of any system part. Adequate service catwalks and ladders should be installed for all equipment to provide worker safety, convenient operation, and convenient maintenance. It is concluded that a well planned and operated preventive maintenance program for foundry ventilation and dust collecting equipment will allow full use of production equipment and provide cleaner, more comfortable working conditions in the foundry.

23304 APTIC NO. 43641

Soderholm, Lars G.

WATER CURTAIN IN EXHAUST HOOD COOLS, CLEANS COMBUSTION PRODUCTS. *Design News, 27(5):44, March 6, 1972.*

A high-pressure spray system for exhaust hoods was developed. A water curtain in the path of the exhaust gases scrubs the combustion products, removes pollutants to a holding tank, and drastically reduces the hot gas temperature. The design and operation of the system are briefly reviewed. The ventilating system is applicable to kitchen use, whether restaurant or industrial, to eliminate grease fires and reduce the spread of cooking odors.

23305 APTIC NO. 43647

Sommerlad, R. E., R. P. Welden, and R. H. Pai

ENVIRONMENTAL CONTROL IN AN AGE OF CHANGE. *Heat Eng. 1971:17-23, March/April 1971.*

Stack emissions of nitrogen oxides and sulfur dioxide and their reduction are discussed. Operating techniques and design considerations were investigated. Tests were made on 32 different utility steam generators ranging from 15 to 850 MW capacity, and firing natural gas, oil and coal. Operational techniques to reduce NOx emissions must minimize other undesirable effects, such as steam temperature variation and increase in carbon monoxide or soot. These techniques involve the degree of turbulence, off stoichiometric firing, biased firing, fuel reduction, and air preheat temperature reduction. Recommended SO_2 removal processes which will further reduce NOx emissions include scrubbing, using additives that also absorb NOx, and dry oxidation-adsorption. NOx concentration trends are reviewed, and NOx limits for large utility boilers are proposed on the basis of current control technology.

23306 APTIC NO. 42764

Sproull, Wayne T.

COLLECTING HIGH RESISTIVITY DUSTS AND FUMES. LABORATORY PERFORMANCE OF A SPECIAL TWO-STAGE PRECIPITATOR. *Ind. Eng. Chem., 47(5):940-944, May 1955. 13 refs.*

In a two stage precipitator, the aerosol is deposited in the second stage on electrodes designed to minimize gaseous ionization and corona current. Theoretically, this should be advantageous in precipitating high resistivity material. To realize this advantage in practice, however, three modifications from conventional design are necessary, judging from the experimental and pilot plant results. These modifications include abnormal electrical clearance in the first stage; high tension collecting electrodes, designed for minimum reentrainment, in the second stage; and reversal of high polarity, at one minute intervals in the second stage. The results indicate that a two stage precipitator with these modifications may offer an alternative to the practice of conditioning the gases to reduce the resistivity of the collected material to 10 to the 10th power ohm-cm or less. The theory underlying these experiments is outlined. (Author abstract modified)

23307 *APTIC NO. 42933*

Stairmand, C. J.

THE DESIGN AND PERFORMANCE OF CYCLONE SEPARATORS. Trans. Inst. Chem. Engrs. (London), vol. 29:356-383, 1951. 5 refs. (Presented at the Institution of Chemical Engineers, Midlands Branch Meeting, Birmingham, England, Dec. 1, 1951 and Institution of Chemical Engineers, London, England, Jan. 8, 1952.)

The general mechanism of operation of cyclone dust collectors is described and performance data for some practical designs are presented. Flow theory, spinning speeds at various radii, prediction of cut, collection efficiency, and grade efficiency curves are considered. Secondary effects affecting efficiency, such as those caused by eddies in the vortex, are also considered. Cyclones are described for particularly fine dusts, coarse dusts, sticky dusts, restricted space, limited headroom, and mist collection. Water cyclones are also described. The main features of a well-designed cyclone are a smooth, truly circular body, with an inlet which will introduce the gas with a minimum of disturbance to the spinning vortex in the body of the cyclone; an exit pipe located axially, preferably of small diameter compared with the body, so as to obtain the maximum separating effect consistent with reasonable pressure drop; and a dust discharge designed to prevent reentrainment of collected dust. Experimental support is given for the views expressed regarding the most efficient design. An appendix is included in which a recommended testing technique is described for assessing, under laboratory conditions, the performance of cyclones and dedusting equipment in general. (Author summary modified)

23308 APTIC NO. 42753

Stirling, Harold T.

BENEFICIATION OF FLY ASH. *Bureau of Mines Information Circ., no. 8488:300-309, 1970. 1 ref. (Presented at the Ash Utilization Symposium, 2nd, Pittsburgh, Pa., March 10-11, 1970.)*

Fly ash beneficiation has resulted in four useful products: carbon, iron, pozzolan, and lightweight aggregate. Iron will be used in steelmaking and possibly for heavy media; the carbon fraction is being investigated for use as a fine form of coke carbon. Some work is being done on the use of carbon as an adsorbent for the removal of sulfur dioxide from flue gas. Potential uses of aluminum fly ash range from the recovery of aluminum and cryolite to the production of alum. Any fly ash beneficiation program should be more profitable with total utilization of all the products. Procedures are outlined for the development of a total utilization process.

23309 APTIC NO. 43441

Strasser, Dale M.

FROM HYDROCARBONS TO CARBON BLACK. *Petrol. Refiner, vol. 33:177-180, Dec. 1954.*

Air pollution control devices utilized in the processing of carbon black are presented, including the Phillips type reactor and the electrostatic precipitators placed before cyclones. Carbon black is intensely utilized in industry as a pigment in production of paints and inks as a rubber reinforcer. Production patterns show a ten-fold increase since 1925. Growth of carbon black produced from liquid hydrocarbons is considerable. Production increased from almost zero in 1943 to 674,000,000 lbs in 1953. Carbon black consists of extremely fine particles ranging from about 10 to 0.0015 micron and roughly spherical inshape. Carbon blacks are manufactured by three basic processes: channel, thermal, and gas or oil furnace methods. Continental Blacks Inc. at Ponca City, Oklahoma, completed in 1954 a new plant to manufacture carbon blacks. The plant utilizes the Phillips type reactor. The process is described. Preheated oil is introduced into the reactor with air and gas, and is cracked to carbon and hydrogen with side reactions producing carbon dioxide, carbon monoxide, and water, also traces of acetylene and methane. The carbon black gas mixture is cooled to about 1200 F in the quench section by direct water sprays. The blackladen gases enters a series of four large-diameter cyclones which separate about 70% of the carbon black. The gases with the remaining carbon black enter another cooling tower where the temperature is reduced to about 270 F. They then pass to the bag filter where orlon bags remove the last traces of carbon black from the gas stream. Continental Blacks, Westlake, Louisiana plant utilizes a wet-collection system. Gases with about 10% of carbon black still entrained are washed in a slot scrubber. The discharged carbon black is pelletized increasing its density to 20 to 30 lb/cu/ft, making it much easier to handle and considerably less dusty. The finished product can be loaded directly into bulk hopper cars or packed in 50-lb 3-ply (or 6-ply for export) kraft paper bags for shipment by rail or trucks. (Author conclusions modified)

23310 APTIC NO. 42307

Stribling, J. G.

THE BURNING PROBLEM. *Water waste Treat., 15(5):14-16, May 1972.*

A rotary hearth furnace for waste incineration has been designed which uses a rotating hearth in conjunction with a cyclonic gas path and computerized analysis and control. The problem of a slow increase in temperature is eliminated by bringing the furnace to a minimum operating temperature of around 1000 C before any waste material is admitted for incineration. This completely eliminates the problems of slow distillation at lower temperatures which plague the orthodox grate. Application of combustion air is entirely above the material to be burnt, which lies in a uniform depth on a solid hearth. Since the combustion air inlets are by means of specially designed tangential nozzles in a vertical cylindrical furnace body, the result is to provide a very rapid cyclonic pattern of gases giving high velocity passage of the air against the burning surface, with resultant high combustion rates. Because the depth of the material is constant, it is possible to obtain an accurate measurement of carbon monoxide at specified control points above the hearth, and to relate the CO produced to the length of time that the material has been in the furnace. A control system rapidly feeds four continual streams of data through a static logic system which adjusts any part of the furnace controls which may be necessary to maintain the furnace environment at its most efficient level. Time of analysis for CO is 15 seconds and for oxygen 40 seconds. Facilities employing the furnace for filter pressed sludge, centrifuged sludge, and tire incineration are described.

23311 APTIC NO. 42663

Sutton, G. P.

ODORS EMITTED BY SEWAGE TREATMENT PLANT AND AIR POLLUTION CAUSED THEREBY. *(Gesui shori puranto kara hasseisuru shuki oyobi sore ni yoru kuki osen). Text in Japanese. Gesuido Kyokai-shi (J. Japan Sewage Works Assoc.), 9(97):33-39, June 1972. 10 refs.*

Odors and their sources in the municipal sewage treatment process are discussed and countermeasures to control them are given. The recommended control measures include preventing anaerobic condition by use of chlorine. Although aeration or addition of oxygen can achieve it, this often results in emission into the atmosphere of the odors. Duckweeds or micro-organisms can be prevented. The sedimentation basin, sprinkling filter, screen device, and supernatant storage tank of digestion tank can be covered with a housing, roof, hood, or cover to prevent odors or bacteria taking the form of an aerosol from being carried away. The more effective method is to collect the gas from these component units of the plant and treat it by scrubbing or adding ozone as is done at the Los Angeles plants where air from the clarifier is collected and used as secondary aeration air and is then scrubbed with water. Aeration, pure ozone, potassium permanganate, chlorine,

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chlorine dioxide, and other additives may be used to treat sewage chemically. Use of dilute gaseous ozone proved effective in reducing odors from the digestion process in Philadelphia. Use of potassium permanganate is effective when iron, manganese, hydrogen sulfide, and organics are present. Scrubbing with water or chemical-added water can be used. Biological treatment of odorous gas is another control method. X-rays and ultraviolet rays can stimulate chemical reactions. Filtering by activated carbon, incineration, electrolytic treatment, and masking can also be used.

23312 APTIC NO. 42343

Suzuki, Shigeto, Giok H. Tjoa, and Karl H. Kilgren

METHOD OF REMOVING HYDROGEN SULFIDE FROM GASEOUS MIXTURES. *(Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,656,887. 7p., April 18, 1972. 3 refs. (Appl. Aug. 21, 1969, 8 claims).*

A process is described for specifically removing hydrogen sulfide and other sulfides from H2S-carbon dioxide-natural gas mixtures. This is accomplished by contacting the sulfide containing fluids with a cyanopyridine and an alkali hydrosulfide, or compounds capable of producing an alkali hydrosulfide, preferably in a substantially hydroxyl-free solvent. After the contact step, the CO2, which may be absorbed, is rejected or desorbed by flashing the sour solution at a lower pressure and/or higher temperature. Previous processes involved physical limitations, high costs, or agents potentially detrimental to the safety of operating personnel and the public at large.

23313 APTIC NO. 42802

Takahashi, Satoru

THE SECONDARY AIR SUPPLY DEVICE FOR INTERNAL COMBUSTION EXHAUST CLEANING SYSTEM. *(Nainen kikan haiki joka sochi no niji kuki kyokyu sochi). Text in Japanese. (Suzuki Automobile Engineering Co., Hamamatsu (Japan)) Japan. Pat. Sho 47-2926. 3p., Jan. 26, 1972. (Appl. June 7, 1969, 1 claim).*

This invention relates to an enforcement secondary air supplier for the exhaust purification of an internal combustion engine. A sub cylinder is attached below the main cylinder and, below the main piston, a sub-piston is attached to associate with the sub- cylinder. When the main piston is making an up and down motion in the main cylinder, the same motion is caused on the sub-piston in the sub-cylinder. Air is supplied from the sub-cylinder due to its expansion-contraction motion. An air pump of this type eliminates the complexity of an external air pump.

23314 APTIC NO. 42388

Tamura, Zensuke

DESULFURIZATION METHOD FROM STACK GAS BY ACTIVATED CARBON. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 940-944. (Dec. 6-11, Paper EN 35D.)*

Tokyo Electric Power Co. and Hitachi Ltd. were jointly entrusted with the research and development of techniques for removing sulfur oxides from the stack gas of large heavy oil electric power stations by the use of activated carbon. The activated carbon process and the 55 MW pilot plant experimental data are discussed. Sulfur dioxide adsorption by activated carbon is simply a physical phenomenon when the adsorbed gas is composed of only SO2 and its quantity is very small. However, when the adsorbed gas also contains oxygen and water, the activated carbon chemically adsorbs SO2, with the quantity of adsorbed gas becoming quite large. This reaction consists of the adsorption of SO2, oxidation of SO2, hydration of sulfur trioxide, and dilution of sulfuric acid. The H2SO4 in the activated carbon can be almost entirely recovered by washing. The carbon that is used to adsorb the sulfur oxides is made from coal which is activated at high temperatures by steam, and has about 700-1000 sq m/g adsorption area. Process characteristics, development progress, and operating results are discussed.

23315 APTIC NO. 42646

Tanaka, Yukio

AIR CLEANING METHOD. *(Kuki seijo hoho). Text in Japanese. (International Thermal Treatment Co. (Japan)) Japan. Pat. Sho 47-14122. 2p., April 27, 1972. (Appl. July 4, 1970, 1 claim).*

The features of this invention are freezing of polluted air in a cyclone separator, adsorbing microparticles such as carbon monoxide, sulfur dioxide, and sulfur trioxide on to ice particles, and precipitating and collecting them in a tank. The polluted air is first led to a negative ionization system of needle electrodes. Here, the gas and microparticles are ionized. The air is then sent into a cyclone separator and is forced down, circulating in the separator. At this time, liquidized air is also sent into the separator and is gasified. The gasification reaction cools the circulating air down to the freezing point, and ice particles are formed in the air. Microparticles of gases are adsorbed on to ice and precipitate into a receptacle at the bottom. The precipitation is discharged. The purified air is emitted in the atmosphere by a suction pump.

23316 APTIC NO. 42635

Tatsutomi, Yasuo and Asao Tadokoro

EXHAUST GAS RECOMBUSTION DEVICE. *(Haiki gasu no sainensho sochi). Text in Japanese. (Toyo Engineering Co., Ltd., Fuchu (Japan) Japan. Pat. Sho 47-7288. 2p., March 17, 1972. (Appl. April 30, 1969, 1 claim).*

An improvement was made on the recombustion gas chamber for automobile internal combustion engine exhaust. In the double walled recombustion chamber in which the inner wall expands to a greater degree than the outer wall and the double walls are separated by a refractory material, the refractory material is often burned by a leakage of high temperature exhaust gas from the pipe connected with the engine. In this device, between the inner and outer pipe, wads of metal fibers are packed in the area of the pipe connection with the engine and the recombustion chamber. Movable pressing springs hold the packing and flanges. When a high temperature exhaust gas infiltrates the metal fibers, the temperature is absorbed in the metal fibers and the refractory material will not be burned.

23317 APTIC NO. 42723

Tenney, Mark W. and Wayne F. Echelberger, Jr.

FLY ASH UTILIZATION IN THE TREATMENT OF POLLUTED WATERS. *Bureau of Mines Information Circ., no. 8488:237-268, 1970. 35 refs. (Presented at the Ash Utilization Symposium, 2nd, Pittsburgh, Pa. March 10-11, 1970.)*

Most fly ashes are uniquely suited for water and waste-water treatment. Fly ash adsorptive capacity increases with carbon content and can be employed to remove detergent, phenols, TNT, refractory organic materials, color, taste and odor, bacteria, and algae. Fly ash with water soluble extracts of calcium, sodium, and potassium can be used for pH and other chemical control. Phosphorous has been removed from lake water with calcium-bearing fly ash. With a specific gravity of 2.14, fly ash can be used to enhance settling and chemical coagulation of turbid water.

23318 APTIC NO. 43280

Tewksbury, T. L., H. Nack, G. R. Smithson, Jr., and David Papier

FLUIDIZED-BED INCINERATION OF SELECTED CARBONACEOUS INDUSTRIAL WASTES. *Preprint, American Inst. of Chemical Engineers, New York, 46p., 1972. (Presented at the American Institute of Chemical Engineers, North Central Regional Meeting, Cleveland, Ohio, April 28, 1972.)*

A program was conducted to determine the feasibility of fluidized-bed incineration for selected carbonaceous industrial wastes. The program consisted of an initial phase in which wastes from the paint plastics, rubber, and textile industries in Ohio were characterized. In the second phase, samples of various wastes were obtained and analyzed, and based on their characteristics, selected wastes were experimentally incinerated in a 10-inch-diameter fluidized-bed system. Results of the program indicated that sludges from solvent recovery operations in the paint industry, sludges from primary treatment of process wastes from plastic manufacturing, flotation sludges from primary treatment of synthetic rubber manufacture, and the waste from the viscose process of the textile industry could be incinerated in a fluidized-bed system without the production of noxious or toxic exhaust gases. The program also indicated that incineration of the various wastes significantly reduced their potential impact on stream pollution. Preliminary economic evaluation of the system for fluidized-bed incineration of the various wastes indicated that operating costs for a commercial installation would be from 0.1 to 1.0 cent for pound of waste incinerated.

23319 APTIC NO. 42465

Tipps, W. M.

INCINERATING CUTTING OILS AND SIMILAR LIQUID EFFLUENTS WITHOUT POLLUTING THE AIR. *Preprint, 5p., 1972. 3 refs. (Presented at the National Plant Engineering and Maintenance Conference, 23rd, Philadelphia, Pa., Jan. 24-27, 1972.)*

Suggestions for design and operation of an industrial waste oil incinerator are presented. Once a suitable collection system has been designed, a common location within the plant should be selected for the waste oil storage tank. Between the storage tank and the incinerator a filtering facility is interposed to remove pieces of trash, chips, paper, and smaller particles, particularly metallic ores. Several factors must be taken into account in the design of the incinerator, including availability of an auxiliary fuel supply, atomization of the oily waste, and the supply of combustion air necessary to ensure complete combustion. Location of the incinerator should be away from residential areas since noise levels can reach 80-85 decibels at the unit. Cooperative efforts between plant and government officials in securing a permit for operation are outlined. It is very important in operation of the incinerator that accurate and complete analyses be made of the oily waste solution. Variations in the percentage of oil can make for expensive operation and can damage equipment that is not properly maintained. An incinerator that is completely instrumented with automatic controls and safety devices will operate at a temperature of 1600-1800 F. At this temperature there should be 100% combustion, with no emission of smoke or odor from the flue gases. The responsibility of the plant engineer in checking on equipment operation and in ensuring that the plant is in compliance with air pollution laws is discussed.

23320 APTIC NO. 42645

Tokuue, Tsunemasa

CENTRIFUGAL AIR CLEANER AUTOMATIC DUST ELIMINATOR. *(Enshinshiki kuki seijokiyo jido jojinben). Text in Japanese. (Tokyo Filter Appliances Co., Ltd. (Japan)) Japan. Pat. Sho 47-9414. 2p., April 10, 1972. (Appl. Dec. 5, 1969, 1 claim).*

This utility model concerns the dust removal openings for a centrifugal type air cleaner. Inside the air cleaner is a filter material. On the circular wall of the filter, many feathers are attached. Between the outer wall of the filter and the cleaner casing is a circular air passage. Openings for dust removal are provided on the lower edge of the cleaner casing. It has lips made of rubber, of some other flexible material, inserted in the casing and attached to the inside walls. The lips are closed when the engine is not operating. When the engine starts to operate, the pressure inside the cleaner changes and palpitating movements open up the flexible circular valve, allowing the dusts to leave the circular air passage. Dust is automatically and continuously removed.

23321 APTIC NO. 42629

Tomii, Hiroshi and Masahisa Inubuse

WATER SURFACE CONTROL DEVICE FOR A WET-TYPE DUST COLLECTOR. *(Shisshiki shujinki-yo suimen seigyo sochi). Text in Japanese. (Kobe Foundry Co., Ltd., Kobe (Japan)) Japan. Pat. Sho 47-154. 2p., Jan. 6, 1972. (Appl. July 21, 1969, 1 claim).*

This invention relates to a water surface control device which consists of two water control tanks that provide a more accurate measurement of the water content of the dust collector. The first water tank with a floating indicator is connected to the second water tank which has a floating indicator serving as the water surface control system for the dust collector. When water in the dust collector is decreased due to evaporation or drained to remove dust, it is automatically supplied from the second water tank to which water is automatically supplied from the first tank. Although the water supply to the first tank is relatively vigorous, so that the waves make the floating indicator unstable and the indication inaccurate, the water supply from the first to the second tank is rather smooth due to the small fall of the water levels. Thus a more accurate water surface indicator for the dust collector is obtained.

23322 APTIC NO. 42654

Tomizawa, Fumio, Katsu Fukayama, Toshihiro Hayashi, Haruo Oguri, and Tsubasa Watanabe

STACK GAS TREATMENT METHOD FOR OXYGEN SUPPLY FURNACE WITH FLUCTUATION OF OXYGEN SUPPLY. *(Sosanryo kahen sogyo o okonau sanso suiseiro no haigasu shori hoho). Text in Japanese. (Idhikawajima- Harima Heavy Industries (Japan)) Japan. Pat. Sho 47-14603. 4p., May 1, 1972. (Appl. Nov. 8, 1969, 1 claim).*

This invention concerns a venturi scrubber with a moveable damper which is used for an electric furnace or converter, or any other oxygen furnace. The gas suction quantity and the venturi scrubber pressure loss are adjusted with the fluctuation of oxygen quantity, and the carbon monoxide combustion level in the flue gas and the dust collection efficiency are maintained at a stable level. An oxygen flow adjustment indicator is installed in the duct for oxygen supply into an oxygen furnace, and a control device is attached at the opening of the venturi scrubber throat damper. Another control device is attached at the damper opening of the suction fan. These control devices respond to the amount of oxygen supply into the furnace, and the opening of the damper is adjusted to the control device automatically or manually. As the amount of oxygen supply changes, the indicator sends a signal, and the dampers for the venturi scrubber and the suction fan entrance respond to it and control the gas quantity and pressure loss.

23323 APTIC NO. 43595

Tow, Philip S.

GRAY IRON INDUSTRY PROBLEMS. *Air Repair, 2(4):128-129, May 1953.*

The use of the cupola furnace by the gray iron industry creates an air pollution problem of increasing concern to many communities. In Los Angeles County two laws apply directly to the operation of these furnaces. One limits the discharge from any source to three min in any hour if such discharge is 40% or greater in capcity at the point of discharge to the atmosphere. The other limits discharge to the atmosphere of dusts and fumes to a percentage of the weight of materials charged to a process, such fraction itself being based on the process weight. The baghouse appears to be the least expensive device that has satisfactory collection efficiency. Water-wash devices have been installed on an experimental basis but none have met the standards. The electrical precipitator represents a large initial expense, but promises to have an advantage in being easier to maintain in proper working order. Since control equipment for small or marginal operators has been prohibitive, many companies which do not have heavy melting requirements have installed gas or oil-fired reverberatory furnaces which easily meet the regulations without control equipment. One disadvantage of the reverbertory furnace is that high carbon iron must be charged to the furnace and generally as pig so that the carbon content will not be reduced excessively.

23324 APTIC NO. 42652

Tsuji, Saburo

COMBUSTION GAS TREATMENT METHOD. *(Nensho haigasu shori hoho). Text in Japanese. (Hitachi Manufacturing Co. (Japan)) Japan. Pat. Sho 47-16164. 5p., May 13, 1972. (Appl. Nov. 1, 1968, 1 claim).*

A simplified combustion gas treatment device is presented. The feature of this invention is a simultaneous adjustment of scrubbing water quantity and the flow of combustion gas, in a gas treatment system where the adsorption, scrubbing, and drying processes are repeated at more than one packed tower, by lapsing the phases. In this system, the passage of the flue gas is opened to all the packed towers without the usual dampers at the entrances and exits. Only scrubbing is achieved by even distribution of water from the top of the tower and supplying of flue gas from the bottom. By elimination of dampers, the structure is simplified and less manpower is needed. Since water comes down gaps between limestones of the packed tower, the passage of exhaust gas is hindered, at the same time controlling the water flow. The slow movement of the gas creates the same effect as a damper interruption.

23325 APTIC NO. 42361

Tsujino, Takao

TREATMENTS OF FLUE GAS FROM TIO2 FIRED FURNACES. *(Nisanka chitan buisho-ro haigasu no shori ni tsuite). Text in Japanese. Netsu kanri (Heat Management: Energy and Pollution Control), 24(6):34-38, June 1972.*

The flue gas from the titanium oxide roasting furnace is discharged at 17,700 N cu m/hr at 350 to 400 C, and contains 190 g/N cu m of moisture, 1470 ppm of sulfur dioxide, 1030 ppm of sulfur trioxide, and about 1 g/N cu m of TiO2 dust. The white smoke has reached 3 to 4 km downwind from the source. Results of purification of the flue gas by the FBWS process show that 94% of dust, 90% of SO2, but only 25% of SO3 are removed. A venturi scrubber with a capacity of 5 cu m/min is then used for the removal of SO3, and a high efficiency of 97% collection is achieved.

23326 APTIC NO. 42804

Tsurumi, Noboru

SOOT AND DUST ELIMINATION DEVICE. *(Baijin jokyo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-2233. 2p., Jan. 21, 1972. (Appl. Aug. 7, 1969, 1 claim).*

This invention relates to a simple device for the removal of particulates, soot, and tar from flue gases. The gas combustion chamber is mantled with a water tank which has an exit leading to a nozzle that can spray vapor on the flue gas at right angles. Hot water vapor from the water tank, resulting from the heat of the combustion chamber, is mixed with air to lower the temperature for quicker condensation after being sprayed on the flue gas. The direction of the dust containing flue gas is changed due to the water vapor spraying from the steam nozzle, and the mixture is led to a condensation chamber where the particulate and soot containing water vapor is condensed, and clean flue gas is released.

23327 APTIC NO. 42319

Turk, Amos, Robert C. Haring, and Robert W. Okey

ODOR CONTROL TECHNOLOGY. *Environ. Sci. Technol., 6(7):602-607, July 1972. 5 refs.*

Odor control devices or systems are essentially the same as those controlling other types of air pollution -- fume incineration, wet scrubbing absorption, process change, or product elimination. Chemical oxidation and masking primarily are employed for odor control. The low olfactory threshold of many compounds and the difficulty in measuring their residual concentrations make subjective techniques necessary to determine the effectiveness of odor correction systems. The selection of judges for odor discrimination tests is considered. An almost standard method of controlling odorous pollutants is dispersing them to a concentration level at which they are no longer detected, or if detected, are no longer offensive. High temperature air oxidation, direct flame oxidation, and catalytic oxidation are indicated. Activated carbon and silica gel are common adsorbents which are extremely useful for concentrating odorants to facilitate recovery. Liquid scrubbing, condensation, and chemical reactions may also be used to destroy odors. Potassium permanganate, the most powerful of the oxidizing agents available, can be used in three ways: as a solution in a scrubbing tower, impregnating a water-adsorbing inorganic substance with a solution, and spreading the permanganate as a dry mixture over the odor producing area. Ozone and chlorine are also effective oxidizing agents. Applications of odor control methods are discussed for the paper industry, petroleum refineries, phthalic anhydride plants, the fertilizer industry, roofing, adhesives, foundries, pesticides, pharmaceuticals, and textile manufacturing.

23328 APTIC NO. 43644

Turner, B.

GRIT EMISSION. *Smokeless Air (London), 32:292-296, 1962.*

Flue-gas particulate emissions are discussed. A size analysis of emitted particulate matter depending on chain grate, sprinkler stoker, and pulverized fuel firing methods is presented. Efficiency standards of removal and removal methods and equipment, including settling, scroll collectors, louvred cone collectors, cellular-type collectors, high-throughput cyclones, high-efficiency cyclones, multicyclones, and electrical precipitation are reviewed. Costs of dust collection and criteria for prevention of emissions are considered.

23329 APTIC NO. 42843

Vandenhoeck, Paul

COOLING HOT GASES BEFORE BAGHOUSE FILTRATION. *Chem. Eng., 79(9): 67-70, May 1, 1972.*

Successful operation of arrays of cloth dust arresters or baghouses in filtering high-temperature gases requires that the gases be properly cooled prior to filtration. Permissible maximum temperatures range from 180 F for cotton bags to 550 F for glass fiber bags. The simplest method of cooling exhaust gases is to dilute them with ambient air. However, dilution is almost always uneconomical because the great volume of ambient air required to achieve the desired cooling necessitates a substantially larger baghouse. Radiation cooling transfers heat from the gas stream to the atmosphere via the duct walls, as the gas travels toward the dust arrester. Radiation cooling of gases that are above 1600 F entails exotic construction materials, while cooling of gases below 1000 F requires substantial surface areas, lengthy duct runs, and increased fan horsepower. Evaporative cooling is accomplished by injecting fine water droplets into the gas stream--the droplets evaporate, absorbing heat from the gas. Requirements for these methods are discussed, as well as overcooling, dust arrester protection, pitfalls to avoid, and cutting costs.

23330 APTIC NO. 42641

Wada, Minoru

CYLINDRICAL DUST COLLECTION TANK FILTER. *(Entokei shujinso no rokaban). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-9408. 2p., April 10, 1972. (Appl. Aug. 16, 1969, 1 claim).*

This is a device to facilitate cleaning of an incinerator filter. The cylindrical dust collector is partitioned by a round filter with a rotation axis in the middle. One side is connected with an incinerator and the other is connected with a stack. The filter is sectioned into a number of pie-shaped segments, and the edges fit into the channel attached inside the wall of the dust bin. There is an opening on the side wall for the exact length of one section of the pie-shaped filter partition and the width of the channel holding the edge of the filter. The pie-shaped filter segments can be cleaned or taken out one at a time, facilitating cleaning and exchanging of filter boards soiled by dusts and soot from the incinerator.

23331 APTIC NO. 42865

Wada, Minoru

DUST COLLECTION DEVICE. *(Shujin sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-155. 2p., Jan. 6, 1972. (Appl. July 23, 1969, 1 claim).*

This invention relates to a dust collector consisting of a funnel- shaped washing tank and a two-layer stack with filter. Dust- containing flue gas is introduced into the washing tank which has a funnel shaped bottom, where water is stored, and a bubble dispersion plate. Flue gas emerging from the water with part of the dust removed is then sucked into the two-layer stack, at the top of which a filter removes the remaining dust which is resupplied to the flue gas inlet tube through the outer layer of the stack. The apparatus has a simple structure but provides excellent dust removal.

23332 APTIC NO. 42725

Walsh, Thomas J.

VARIOUS SYSTEMS FOR MEASURING AND CONTROLLING AIR POLLUTION. *Preprint, 4p., 1972. (Presented at the National Plant Engineering and Maintenance Conference, 23rd, Philadelphia, Pa., Jan. 24-27, 1972.)*

Measuring and control techniques for emissions from industrial sources are summarized. The basic theory and applications of several monitoring techniques are described. These include isokinetic and balloon sampling, microscopic examination, chemical analysis, smokemeters, spectrometry, bubble filters, and chromatography. Control techniques for particulates include cyclones, scrubbers, filters, precipitators, and incinerators. Control techniques for vapors or gases include scrubbers, incineration, charcoal absorption, and vapor cooling processes.

23333 APTIC NO. 42621

Watanabe, Kiyoshi and Shiro Watanabe

AUTOMOTIVE EXHAUST GAS COMBUSTION DEVICE. *(Jidosha kaiki gasu nensho sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-10565. 4p., March 30, 1972. (Appl. April 1, 1967, 1 claim).*

Exhaust emission pipes from three cylinders are collected into one pipe. Each one has a jet injection pipe inside where the mixture of blowby gas and air is pressurized, heated, and emitted toward the collective pipe. The pipe from the fourth cylinder extends horizontally through the length of the collective pipe, creating a whirlpool of gas flow and at the same time equalizing the high temperature. The collective pipe has an opening to a recombustion pipe where the mixture of exhaust gas, blowby gas, and air is burned completely. The heat goes to the heat exchanger, which consists of a number of heat discharge pipes that are collected into one pipe. The pipe is connected with a muffler, and gas is emitted in the atmosphere. The heat exchanger is connected with an air pump which rotates using part of engine rotation, and the air suction opening is connected with the engine crank case blowby gas emission opening.

23334 APTIC NO. 42644

Watanabe, Tamotsu

WET-TYPE DUST ELIMINATION DEVICE. *(Shisshiki jojin sochi). Text in Japanese. (Nihon Kogei Kogyo (Japan Industrial Arts Co., Ltd.)) Japan. Pat. Sho 47-12279. 3p., April 15, 1972. (Appl. March 20, 1969, 1 claim).*

This invention combines an electrostatic precipitator and a venturi scrubber and achieves an efficient dust collection with economical water use. The device is a vertical venturi scrubber into which an area of electrostatic precipitation is introduced. The walls act as an electrode, maintaining earth electric potential, and the wire hanging at the center of the scrubber creates and maintains a high potential to charge the dusts in the gas. Water is supplied from a water tank outside into the shallow pool around the edge of venturi and overflows along the wall forming a thin film. Thus, the inner wall of the venturi scrubber collects electrified dusts and washes down most of them. The outlet at the bottom is small and forms a water spray. Atomized water captures the rest of the dust that escaped from the electrodes and water film. The water receptacle blow has several baffleboards which direct the flow of cleaned air to an exhaust pipe.

23335 APTIC NO. 42351

Watson, William E. and Donald A. Aubrecht

PROCESSING OF SULFUR DIOXIDE. *(Allied Chemical Corp., New York) U. S. Pat. 3,653,833. 7p., April 4, 1972. 6 refs. (Appl. Dec. 9, 1969, 14 laims).*

A reduction system is described for converting sulfur dioxide to elemental sulfur and/or other gaseous sulfur products in a practical and economical commercial plant design. The reaction gas mixture always passes through the reaction chamber in the same direction to provide a uniform temperature profile and stable operating conditions. Temperatures in the reactor are maintained between 1000 and 2400 F, preferably between 1500 and 2000 F, and thus do not seriously affect the catalysts which are normally used in the reduction of SO2. There is no need for a second reaction zone to keep the temperature of the reaction gases within narrow limits to avoid premature degradation of the catalyst employed and to attain the desired reaction products. The reaction chamber contains a suitable catalytic material, preferably in the form of small balls or pebbles of approximately 1/4-3/4 inches in diameter. Reaction products exiting from the reactor are then contacted with a contact mass to cool these gases to a temperature of about 700-800 F. When the contact mass becomes too hot to cool the reaction product gases to the desired temperature, the cycle is reversed; that is, the contact mass previously used to heat the reaction gases is now used to cool the reaction products and the contact mass used to heat the reaction gases is now used to cool the reaction product gases. Bauxite, alumina, silica, calcium sulfide, vanadium oxides, and any of the well known catalysts previously employed may be utilized.

23336 APTIC NO. 43674

Weart, Harry W.

SMALL CUPOLA SPORTS NEW BONNET. *Mod. Casting, 28(4):37-38, Oct. 1955. 2 refs.*

The University of Wisconsin improved its cupola by installing a closed, water-cooled bonnet that cools cupola exhaust gases and prevents both hot gases and sparks from creating a fire hazard to adjacent property. The entire unit is located inside the foundry building which has a ceiling height of only 18 ft 4 in. directly over the cupola. The cone mounted directly over the stack and the 3/4 in. pipe ring that cools it are suspended from the walls of the bonnet and are removable as a unit for servicing. The 1/8 in. holes which create the cooling sprays are drilled at such angles that the entire upper surface of the cone is well covered with cooling water. The overflow from the water pan surmounting the bonnet is directed on the center of the cone. The 3/4 in. pipe ring welded to the outer walls of the bonnet also has 1/8 in. holes drilled so as to direct a continous sheet of water down the side walls. Further cooling of the exhaust gases is accomplished in the downcomer by spray nozzles of the type used for spraying field plants. The closed operation of the system is attractive because of the improvement in foundry fume and dust control.

23337 APTIC NO. 43408

Weaver, Elmer R.

CONTROL OF ODORS. *National Bureau of Standards, Washington, D. C., Natl. Bur. Std. Tech. Circ. 49, 15p., April 17, 1950. 38 refs.*

Practical information concerning control of industrial and household odors is presented. Some of the information may be useful in hospitals and places of business. There are several possible solutions to the problem of preventing or disposing of an industrial odor without nuisance to the community. For odorous dusts and mists, electrical precipitation or centrifugal separation, with or without the condensation of added steam, is often useful. Buildings can be made tight, provided with fans, and ventilated so that air-flow is outward at one point and inward at all others. When odor has been confined to single air stream, it is disposed of by dispersal, burning, or adsorption (sometimes by precipitation, solution, or chemical action). In households and places of business, odors can be avoided by cleaning, effective ventilation, and removing sources of odor. Utilization of detergents (nonvolatile and nonpoisonous) is recommended. Activated carbon has been used for at least 30 yrs for control of odors in refrigerators. Another means of preventing transfer of odors is by enclosing foods in tight containers (plastic, aluminum foil, and paraffin paper). Airborne odors can be divided into substances that tend to produce insensibility of the olfactory tract, and substances have odors that mask other odors or render them less noticeable (deodorants). The noxious effects of ozone are emphasized. Control of odors in sick rooms and hospitals, especially mental, is important because of the close connection between perception of odors and emotions. Thorough cleaning and ventilation are imperative. A rubber tube introduced under the blankets of a bed and connected to suction is effective in controlling much of the odor from diseased patients. Counterodorants may be useful but should be chosen with attention to the associations likely to be produced. Manufacturers of quaternary ammonium compounds suggested for trial in preventing decay of putrescible material are listed.

23338 APTIC NO. 43414

Weeks, Larry

CONTROL OF EMISSIONS FROM AN EXISTING KRAFT RECOVERY BOILER. *Preprint, American Chemical Society, Washington, D. C., 7p., 1971. (Presented at the American Chemical Society, Northwest Regional Meeting, 26th, Bozeman, Mont., June 16-18, 1971.)*

The conversion of a conventional, direct-contact evaporator, Babcock and Wilcox recovery boiler to a new low emission concept recovery boiler design is described. The latest recovery technology is based upon the elimination of the direct contact of flue gas and black liquor, and the use of high efficiency dry-bottom electrostatic precipitators for particulate collection. The unit is a two-pass, forced circulation unit, rated for 49,000 lb/hr of evaporation. The liquor solids are raised from a feed of 39-43% to a product of 60-63%. These product solids are monitored continuously with a refractometer. From a storage tank, the liquor is pumped to a sluice tank under the precipitator, where the recovered salt cake is mixed with liquor, then to the mix tank where the dry makeup salt cake is added and then fired in the furnace. Steam is used for evaporation, and the vapor is used to heat the weak liquor feed to the multiple effect evaporators and the hot water in two separate condensers. A large vertical steel-tube Economizer is used to recover the heat in the flue gas previously used for direct contact evaporation, and to lower the flue gas temperature entering the precipitator. The electrostatic precipitator employed is designed for an efficiency of 99%. The results after 6 weeks of operation showed good operation of the concentrator in maintaining satisfactory firing solids, excellent steam production, and a reduction in TRS emissions from more than 400 ppm to less than 17.5 ppm. There were also no significant amounts of sulfur dioxide emitted from the stack. Initial conveying problems in the bottom of the precipitator were solved with bigger screw conveyors. Work is in progress to improve the operation of the electrostatic precipitator and to bring the particulate emission within the standards of the State of Montana.

23339 APTIC NO. 42674

Weidensaul, T. C.

ARE TREES EFFICIENT AIR PURIFIERS? Ohio Rep., 57(4):57-60, July- Aug. 1972. 6 refs.

When viewed in their proper perspective, the value of plants as air purifiers and suppliers of oxygen is questionable. The amount of oxygen emitted and the amount of carbon dioxide absorbed can be calculated from the amount of carbon produced in any given ecosystem. However, there have been few, if any, attempts to monitor ambient air for the amounts of oxygen produced by an acre of trees or CO2 removed from the atmosphere over this same acre. Tables are presented which depict the relative importance of plants as oxygen producers. Nearly 88% of all oxygen produced on earth through photosynthesis originates in the sea. The relationship of oxygen production and CO2 consumption to plant vigor and the rate of growth of the plant is a direct one. Another interesting way of viewing the importance of green plants in oxygen production and CO2 consumption is by replacing these functions to human respiration requirements.

23340 APTIC NO. 42413

Wilder, John E. and Charles E. Billings

PERFORMANCE OF FABRIC FILTRATION SYSTEMS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 680-689. 15 refs. (Dec. 6-11, Paper EN 16B.)*

A fabric filter consists of a woven or felted textile material in the shape of a cylindrical bag, tube, or flat supported envelope. Many individual filter elements are contained in a single housing having gas inlet and outlet connections, a dust storage hopper, and mechanisms for periodically cleaning the fabric in place. Modern fabrics permit operation at elevated temperatures (500 F) with resistance to corrosive chemical constituents of the filtered gas or collected particles. Description of the performance of fabric filter systems involves specification of filter pressure drop, filter collection efficiency, and service life factors for fabric and filter components. Pressure drop prediction models are considered in terms of dust, gas, and cleaning mechanism parameters. Intermittent collectors, continuous multi compartmented collectors, reverse pulse collectors, and reverse jet collectors are discussed. The apparent overall resistance of four types of fabric filters is compared.

23341 APTIC NO. 43616

Wilkins, D. M.

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSION OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED BED COMBUSTION OF COAL. APPENDIX 3. EXPERIMENTS WITH THE 27 IN COMBUSTOR. (TASK III). *National*

Coal Board, London (England), Fluidised Combustion Control Group, Office of Air Programs APTD-1083, Rept. DHB 060971, 76p., Sept. 1971.

NTIS: PB 210674

A 27-inch combustor for fluidized bed combustion of coal was tested to determine the effects of various operating variables, primarily limestone addition, on corrosion of evaporator, superheater, and reheater metals immersed in the fluid bed. Plant design and dimensions, instrumentation, data processing, and operating precedures are reviewed. Complete data on the effects of limestone additive, particle size, bed height, coal type, fluidizing velocity, bed temperature, and calcium/sulfur mol ratio on corrosion, sulfur retention, and emissions of sulfur dioxide and nitrogen oxides are included.

23342 APTIC NO. 42431

Williamson, D. F. and J. Klimovich

ENGINEERING TO SAFEGUARD OUR ENVIRONMENT. *Can. Pulp Paper Assn., Tech. Sec., Tech. Paper, no. 1:D25-D27, 1971. (Presented at the Annual Meeting, 57th, Jan. 26-29, 1971.)*

Accomplishments in the area of emission reductions by members of the pulp and paper industry are described. Particulate emissions levels from the recovery boiler, lime kiln, and smelt tank vent and total reduced sulfur emission from the recovery boiler at the new American Can Company mill at Halsey, Oregon are compared with Oregon state regulation for 1972 and 1975. Achievements at other mills in effluent color reduction and sulfite recovery are described. Typical kraft mill odorous gas emission reduction from black liquor oxidation, gas scrubbing, turpentine recovery systems, and vaporshere processes are presented. Some areas for possible research and improvement include: reduction of gland water to process pumps, use of mechanical seals on specific applications, stripping of contaminated condensate with flash process steam, recycling of primary effluent treatment sludge, and reduction of pulp and paper effluent color.

23343 APTIC NO. 42309

Wulf, Helmut

COMBUSTION ON THE OCEAN TO WIND STRENGTH 9. ELIMINATION OF CHLORINATED HYDROCARBONS. *(Verbrennung auf See bis Windstaerke 9. Besitigung von chlorierten Kohlenwasserstoffen). Text in German. Umwelt (Duesseldorf), 2(3):48-49, June-July 1972.*

Two boats, Mathias I and II, are used for the combustion of chlorinated hydrocarbons in the North Sea 20 nautical miles from Scheveningen in the Netherlands. The boats load their cargo, leave the harbor, and only when the designated area is reached the incinerator is ignited and heated to 1000 C. Mathias I has a combustion capacity of 3.6 tons/hr, Mathias II of 12 tons/hr. Complete combustion must be achieved to avoid emission of unburned or partially burned matter with the waste gases. These substances would be toxic to marine life. Measurements in the fall of 1971 have revealed that the waste gases contain less than 0.01% unburned hydrocarbons. Experiments with fish placed into water mixed with condensed waste gases proved their complete harmlessness. The good combustion is achieved by the large energy spent on atomization of the waste material. The gaseous hydrochloric acid components of the waste gases condense rapidly, and drop to the ocean surface where they are neutralized by alkaline compounds of the sea water. Combustion is feasible only to a wind strength of 9. The method is expensive (the average cost for transport, including combustion, amounts to $55/ton of refuse), but one which is least polluting.

23344 APTIC NO. 43639

Wyss, W. F.

DESULPHURISATION OF COALS AND COKES. *BCURA (Brit. Coal Util. Res. Ass.) Monthly Bull., 34(1):2-8, Jan. 1970. 40 refs.*

Various desulfurization processes for coals and cokes are reviewed. Techniques to remove inorganic sulfur from coals before carbonization or combustion, including washing, centrifuging, and density and magnetic separation, are examined. Desulfurization techniques to remove either organic or inorganic sulfur during the coking process or from the finished coke include reducing gases; the addition of hydrogen sulfide acceptors, i.e., lime; carbonizing in hydrogen; thermal desulfurization; fluidized bed combustion; calcined dolomite absorption; and process modification for existing processes.

23345 APTIC NO. 43233

Zuykova, E. Yu.

FILTRATION AS A METHOD OF REMOVING MICROBES FROM THE AIR. *Gigiena i Sanit., 24(6):72-73, 1959. 13 refs. Translated from Russian. Dept. of the Army, Frederick, Md., Fort Detrick, 3p., July 1968.*

NTIS: AD 680489

Filtration is one of the simplest and more perspective methods of removing microorganisms from the air. The filtration capacities of FP-5 filters and membrane filters were compared. Two series of investigations were conducted. The first was conducted in one of the laboratory rooms, with the natural microflora of the air; the second, in an experimental chamber into which a 0.1 ml culture suspension of Bacterium prodigiosum was diffused. In the tests conducted in the laboratory room, the filtration capacity of the FP type filters ranged from 99.8 to 100%. The filtration capacity of the membrane filters was also high; it ranged within the limits of 99.89 to 100%. In the tests conducted in the experimental chamber, in 19 out of 20 cases, the FP filters retained 100% of the diffused culture, and in one case retained 99.995%. The membrane filters retained 99.978% of the culture. The filters possess a high filtration capacity with regard to a bacterial aerosol in dust or droplet phase. The FP type filters are more convenient and simple to use than the membrane filters, and are recommended for air purification from microorganisms.

MEASUREMENT METHODS

23346 APTIC NO. 42375

X-RAYS USED IN AIR POLLUTANT DETECTION. *(Roentgenstrahlen als Detektive der Luftverschmutzung). Text in German. Technica, 21 (10):909, May 1972.*

A Diemens Sequence x-ray Spectrometer with tabulator control is used for the x-ray fluorescence analysis of air pollutants at an air pollution monitoring station in West Germany. This technique, suitable for the detection and quantitative determination of elements with atomic numbers ranging from 9 (fluorine) through 92 (uranium), permits comprehensive test series to be performed automatically in relatively short time. The aerosol samples (precipitation or filter deposits) are irradiated with high intensity X-rays, and the spectral breakdown of the secondary radiation thus generated is made by means of an analyzer crystal to determine the composition of the sample and the quantitative proportion of certain elements. Automatic evaluation of nine preselected spectral lines is possible, whereas the tabulator control can be extended to a maximum of 36 spectral lines. The data are punched on punch cards for central data processing. Highly sensitive detection methods for sulfur and fluorine have been elaborated.

23347 APTIC NO. 42711

MEASURING OF ODORS (NO. 5). EXAMINATION OF ANALYSIS OF ORGANIC SULFUR COMPOUNDS BY FILTER PAPER SAMPLER AND ITS APPLICATION TO HYDROGEN SULFIDE AND ALDEHYDE MEASUREMENT. *(Akushu no sokutei (V), roshi shiki sanpura ni yoru yuki io kagobutsu no hoshu bunsekiho no kento narabi ni ryuka suiso oyobi arudehido rui sokutei e no* *oyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):118, 1969. (Presented at the Japan Society of Air Pollution, Annual Meeting, 10th, Tokyo, Japan, 1969, Paper 117.)*

The efficiency of filter-paper samplers, the types of filter paper that influence analyses, the concentration method of gas, gas chromatography conditions, calibration methods were examined. Three types of filter papers, 20% methyl mercaptan sodium solution, ethyl mercaptan, and dimethylsulfide were used as test materials. It is desirable to eliminate water content. The optimum flow speed of concentration gas was 0.2 l/min. By setting gas chromatography at column temperature 47 C, nitrogen carrier gas flow at 30 l/min, and the column 2.25 m long, the material gas analysis time was considerably shortened. Ethyl mercaptan and dimethylsulfide were completely separated. The repeatability fluctuation index was approximately 6%. The collection rates of various filters showed a considerable difference, both by types and gases.

23348 APTIC NO. 42926

COMMUNITY AIR SAMPLING. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 8, p. 77-94. 78 refs.*

Two important factors in measuring the concentration of a pollutant in the atmosphere are the specificity and the sensitivity of the instrumentation available for measurement. Other important factors in sampling are the time period over which each sample is taken, the number and size of samples to be collected, location of sampling stations, and alteration of collected substances during and after collection. Effects of elevation and topography, diurnal variations, and seasonal variations are considered. The choice of instruments to evaluate air pollution levels will vary according to the condition being assessed and the use to be made of the data. Dustfall sampling is described. The sampling of air particulate matter may be accomplished by filter samplers, impingement apparatus, precipitators, and photometric instruments, as well as by other aerosol sampling devices such as the beryllium air monitor and pollen sampling apparatus. Methods of collecting gaseous matter are indicated, including instrumentation for the determination of sulfur dioxide, carbon disulfide, hydrogen sulfide, cyanides, fluorides, nitrogen oxides, ozone and total oxidants, carbon monoxide, and trace organic gases. In any community type sampling program for air pollution evaluation, the meteorology and topography of the area are extremely critical.

23349 APTIC NO. 42927

STACK SAMPLING. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 9, p. 95-110. 32 refs.*

Stack sampling is a complex subject which is kept from becoming routine through the wide range of physical and chemical properties of materials discharged, together with the wide range of stack conditions encountered. The objective of the sampling program must be identified, and a clear plan of action outlined before sampling is performed. Selection of the sampling location is considered. Instruments for measuring gas velocities in stacks are indicated, as well as methods for the measurement of stack gas temperatures. Steps in sampling, isokinetic sampling, probes, vacuum sources, and collecting devices are discussed. Impingers, filters, cyclones, and electrostatic filters are described for collecting particulate matter. In addition to impingers for the collection of gases and vapors, various types of gas washing bottles are available. The freeze-out method of sampling may be used when small amounts of materials, which are difficult to capture by any other method, are to be sampled.

23350 APTIC NO. 42928

CHEMICAL PROCEDURES. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 10, p. 111-131. 234 refs.*

The analysis of particulate matter collected from the atmosphere involves consideration of aspects other than chemical content; for instance, one of the most important indices followed in air pollution assessment is the atmospheric loading/unit of surface area and/unit of volume. The introduction of new techniques, such as electron microscopy, has made it possible to carry out more searching assessment of the morphology and other physical properties of particulates. Aluminum and aluminum oxide may be determined spectrographically and colorimetrically, while procedures based on the formation of molybdenum blue or reactions with silver diethyldithiocarbamate in pyridine can be used to determine arsenic. Spectrographic, fluorometric, and colorimetric procedures can be used to identify beryllium, while a spectrographic and an electrochromatographic technique are available for boron determinations. Analytical methods are also indicated for the determination of calcium, cadmium, carbon monoxide, chlorine, chromium, fluorine, iron, lead, magnesium, manganese, nickel, the nitrogen oxides, ozone, peroxides, and other oxidants, silicon dioxide and silicates, sulfur dioxide, sulfur trioxide, sulfuric acid, hydrogen sulfide, and zinc. The identification and quantitative determination of organic substances is discussed, with particular reference made to organic acids, aldehydes, amines, hydrocarbons, ketones, phenols, proteins, quinones, and sulfur compounds.

23351 APTIC NO. 42929

ODORS. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 11, p. 133-150. 50 refs.*

Odor is a stimulus which is perceived by the receptors of the olfactory epithelium, an area of 2.5 sq cm within the upper nasal cavity. Dispersion of an odor source into the atmosphere may occur by evaporation, diffusion, convection, desorption, aerosol formation, or a combination of these. The concept of odor source involves both substance and process. The substance furnishes odorant to the atmosphere; the process is the method of its dispersal. Odor measurements may refer to material measurements of odorants or psychological scaling of odor perceptions. Measurement by adsorption, collection by condensation, oxidative measurements, and qualitiative analysis are considered. At least four different perceptual attributes of odors are of practical interest: intensity, quality, pervasiveness, and acceptability. The major problems in olfactory measurements are the selection and calibration of the necessary human instruments, standardization and reproduction of the sample being measured, and specification of measurement procedures for each of these four attributes. The dispersal of gases by stacks, combustion or oxidation, adsorption, absorption, masking, and other methods of odor control are described.

23352 APTIC NO. 43376

EPA SAYS NO TO AIR POLLUTION TEST FOR NO2. *Chem. Week, 111(3):31, July 19, 1972.*

Regulations for nitrogen dioxide that were to have been put into effect July 1, 1972, have been pushed back to July 1, 1973, since the analytical measurement technique for NO2 has been proved faulty. In the Jacob-Hochheiser test, air is continuously bubbled through a sodium hydroxide solution. The NO2 in the air forms a stable solution of sodium nitrite, which, when reacted at the analysis center with reagents, provides a measurement of the NO2, colorimetrically. Tests showed that only 35% of the NO2 in the air was collected by the sodium hydroxide solution, and the Environmental Protection Agency used this factor in its calculations. The validity of the 35% calculation factor has been questioned. For example, 35% collection efficiency was found at NO2 concentrations of 110-180 micrograms/cu m, but at low concentrations of NO2, efficiency increased greatly. At this point, EPA researchers believe an instrumented chemiluminescent technique has possibilities. The reaction of nitric oxide with ozone (generated by the instrument) produces the chemiluminescent effect that is measured.

23353 APTIC NO. 43555

TNO, Delft (The Netherlands), Research Inst. for Public Health Engineering

REVIEW OF ANALYTICAL METHODS FOR THE DETERMINATION OF PULLUTANTS IN INDOOR AIR, ATMOSPHERIC AIR AND IN WATER. *14p., June 1970.*

Analytical methods for the determination of over 100 pollutants in air and water are presented tabularly, including the lower limit or smallest concentration which can be determined with a standard deviation of about 10%. The pollutant to be determined, the medium in which it can be determined, air sampling apparatus and flow rates, and the analytical procedure are also indicated. Photographs of some of the instruments are included.

23354 APTIC NO. 43560

Asbestos Textile Inst., Pompton Lakes, N. J.

MEASUREMENT OF AIRBORNE ASBESTOS FIBER BY THE MEMBRANE FILTER METHOD. *Asbestos Textile Inst., 16p., 1971. 9 refs.*

A procedure was designed specifically for the determination of concentrations of asbestos fibers 5 micron or longer using phase contrast microscopy. Airborne asbestos fibers are collected by drawing a specified volume of air through a membrane filter by use of a suction pump. A representative section of the filter is removed, properly mounted on a microscope slide, and examined at a magnification of 430x using phase contrast optics. The number and length range of fibers observed in a given area under the microscope are noted and used to calculate the number of fibers per cu cm of air sampled. The apparatus, materials, and procedure are described, including equipment calibration and calculations.

23355 APTIC NO. 43402

Altman, Laurence

OPTOELECTRONICS ENGINEERS PIT LASERS AGAINST AIR POLLUTION. *Electronics, 44(25):64-68, Dec. 6, 1971. 1 ref.*

Semiconductor and spin-flip Raman laser systems that can be tuned to the exact wavelength of air pollutants for on-site monitoring are described. Diodes are being developed to achieve emissions in the required band to measure automobile exhaust emissions. In a scheme being developed for General Motors, an array of lasers will be put together with a suitable one-for-one array of detectors in the path of the automobile exhaust. Each lead-tin-tellurium diode would be doped with enough tin to make it emit at the absorption line of one of the pollutants that are being measured. The focus of the developmental work is to make the diode laser operate in the cw mode, which is best for spectroscopy. In a separate effort, the feasibility of a prototype package which could be used as multi purpose infrared monitoring system is being studied. It would be an inexpensive active system suitable for across-the-stack or ambient monitoring of sulfur dioxide, nitric oxide, or other smokestack gases. With tunable spin-flip Raman lasers, NO concentrations as low as 1 ppb have been measured in about 1 sec. Presently, the nitrogen laser has the highest average photon output though its signal-to-noise ratio is much lower than those of lasers operating below the ozone cutoff. The neon ion laser, with a 1-W output at 2678 A and a signal-to-noise ratio six orders of magnitude greater than that of the nitrogen laser, would--if it becomes available--be the logical choice for a Raman system.

23356 APTIC NO. 42333

Arundel, P. A., S. D. Bibb, and R. G. Boothroyd

DISPERSED DENSITY DISTRIBUTION AND EXTENT OF AGGLOMERATION IN A POLYDISPERSE FINE PARTICLE SUSPENSION FLOWING TURBULENTLY UPWARDS IN A DUST. *Powder Technol. (Amsterdam), 4(6):302-312, Sept. 1971. 21 refs.*

A study was conducted to measure the particle dispersion density of an upward-flowing suspension. The design and behavior of a special null-comparator optical densitometer, developed for taking these measurements, is described in detail. Measurements are reported on the mean dispersion density of a suspension of 0-40 micron zinc particles flowing upwards in a 3 in diameter tube. Due to electrostatic charging of the particles, the dispersion density increases markedly towards the wall; this indicates that only a limited degree of particle agglomeration occurs in the center of the pipe, but that this increases towards the wall. Agglomeration of processed particulates has an important bearing on the efficiency of chemical processes, and this is the first attempt to quanitatively measure the extent of agglomeration in a dense flowing suspension.

23357 APTIC NO. 43447

Bando, Shoji and Tsuyoshi Imahashi

DETERMINATION OF VANADIUM IN DEPOSIT AND AIRBORNE PARTICULATE BY NEUTRON ACTIVATION ANALYSIS. *(Koka baijin, fuyujinai chu banajiumu no hoshaka bunseki). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 18(12):1477-1482, Dec. 1969. 12 refs.*

A method of neutron activation analysis was developed for the determination of trace amount of vanadium in deposited and in airborne particulates. The sample, irradiated for 2 min in JRR-1, was fused with sodium hydroxide. Vanadium was extracted from pH 4 solution into chloroform as its 2-methyl-oxine complex. The radioactivity, gamma-ray energy 1.44 MeV, of V (52) was measured and the value was corrected for the chemical yield, average 95%, obtained by photometry. The time for a determination was about 10 min. The proposed method is simple, rapid, and applicable to as little as 0.03 micrograms of airborne particulates.

23358 APTIC NO. 42407

Bartle, E. R., M. Griggs, and C. B. Ludwig

GLOBAL SURVEILLANCE OF AIR POLLUTION. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1102-1107. 11 refs. (Dec. 6-11, Paper ME 26C.)*

Extensive low- and high-resolution atmospheric transmission calculations were performed to establish the feasibility of remotely detecting air pollutants. The measurement of global isopleths of the gaseous pollutants carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen dioxide, ammonia, nitrous oxide, and methane can be accomplished from satellites. The objective is to determine dispersal rates and long-term global buildup of gaseous pollutants, the movement of contaminated air masses in order to aid in worldwide forecasting of regional pollution levels, and the influence of these pollutants on the global heat balance and thus on global meteorology. Satellite measurements of pollutants can best be accomplished by specialized sensors in the infrared region from 2-20 micron. In the spectral regions where reflected sunlight can be utilized, the integrated amount of the pollutant through the entire atmosphere is obtained. In the regions where the thermal emission must be utilized, the pollutant's concentration in the altitude range from 0.7-7 km is obtained. When pollutants have spectral bands in both regions, information is obtained for deducing vertical distributions. An instrument based on the non-dispersive technique is indicated for the detection of air pollutants from satellites. (Author conclusions modified)

23359 APTIC NO. 43172

Bayer, J. L., G. H. Denton, and R. E. Hassel

USE OF THE AMEDA MICROSCOPE IN QUANTITATIVE MICROSCOPY. *Am. Soc. Testing Mater. Spec. Tech. Publ., no. 430:118-128, 1968. 2 refs.*

Basic functions of the Automatic Microscope Electronic Data Accumulator system are to point count microconstituents of a specimen based on differences in the amount of reflected or transmitted light emitted from an entity as it passes under a microscope objective at a constant rate of speed, and to categorize these entities into preset size categories. Logic circuitry is provided to record the output of multiple reflectance or transmission levels, particle sizes, and particle size distribution. The number and type of outputs is determined by each mode of operation. The size determinations are carried out at a traversing speed of 1 mm/sec, and the size categories are expressed in microns and set as follows: below 3, 4-7, 8-15, 16-31, 32-63, 64-127, 128-255, 256-511, 412-1023, and plus 1024; however, these categories can be altered by replacing various electronic components. Accumulation of particle sizes is done at specific reflectance levels as set on the control unit. The logic circuitry can also be set up to carry out point counting and size distribution simultaneously. The unit has been used successfully in the following areas: determination of the volume fraction, average particle size, and distribution of pyrite in coal; the microstructure of metallurgical coke in terms of porosity and the relative amount and size of pores and walls; volume fraction, average particle size, and distribution of certain nonmetallic inclusions in steel specimens; determination of the number and average size of surface pits on tin plate; quantitative determination of the amount of rust developed on tin plate specimens subjected to corrosive atmospheres; and determination of the average grain size and distribution in steel specimens. (Author abstract modified)

23360 APTIC NO. 43546

Bethea, Robert M.

COMPARISON OF HYDROGEN SULFIDE ANALYSIS TECHNIQUES. *Environmental Protection Agency, Research Triangle Park, N. C., Office of Engineering Analysis, 11p., May 25, 1972. 34 refs.*

A summary and critique of common method of analysis for hydrogen sulfide are presented. The procedures described include reflectance from silver plates and lead acetate-coated tiles, lead acetate and mercuric chloride paper tape, sodium nitroprusside, methylene blue wet chemical methods, infrared spectrophotometry, and gas chromatography. Pertinent details included for each method are type (continuous, semi-continuous, averaging), lower detection limit, range, known interferences and suggestions for their elimination, and appropriate instrument parameters such as wavelength, flow rates, temperature, and sample size. The limitations of each technique are clearly described, as are the advantages, in such a manner as to aid the user to select proper instrumentation for his analytical requirements.

23361 APTIC NO. 43331

Birk, William H.

GAS TURBINE SMOKE EMISSION SAMPLING USING NAVY SPECIFICATION TEST METHOD. *Naval Air Propulsion Test Center, Trenton, N. J., Proc. Natl. Conf. Environ. Effects Aircraft Propulsion Systems, 10th, Trenton, N. J., 1971, p. 23-1 to 23-3. 4 refs. (May 18-20.)*

The emission of smoke from gas turbine engines is of serious concern to the Navy because it permits easy visual detection of aircraft at a great distance. Efforts to control smoke emission generated a need for a reliable measure of smoke density which could be used for evaluating service engines and the establishment of limiting values for new engine procurement. The stained filter technique is subject to typical sampling problems such as obtaining a representative sample, agglomeration in the sample line and deposits in the line. However because it is an acceptable, widely used procedure with adequate response for the range of smoke density encountered in gas turbine engines it was adapted for the Navy. The apparatus includes straight-through, full-flow ball valves in the sample and by-pass lines and power actuators for operating the valves in conjunction with an electric timer. A hinged type filter holder has been incorporated to facilitate the insertion and removal of filters. The membrane filter retains the sample on the surface rather than permitting particles to penetrate and distribute themselves throughout the thickness of the filter as occurs in fibrous type materials. The sampling location specified requires an exhaust stream velocity at the probe inlet of 0.5 Mach or less. Sample time is based on the prescribed sample volume of 0.15 cu ft measured at the exhaust discharge conditions of pressure and temperature. Reflectance of the filter, the test result used to determine the acceptability of the engine smoke characteristics, is obtained with a diffuse type reflectometer. The limit of this method is based on the visibility of the exhaust plume. A constant volume sample at the exhaust exit conditions is used as a basis for relating the exhaust exit diameter of the engine to a measure of the overall visibility of opacity of the plume.

23362 APTIC NO. 42718

Blanchard, M. B., N. H. Farlow, and G. V. Ferry

METHODS OF ANALYZING MICROSIZE PARTICULATE AEROSOLS AND CONTAMINANTS. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 3p., 1971. 10 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 17-1104.)*

Cosmic dust investigations at Ames Research Center have led to the development of unique methods for analyzing atmospheric aerosols and particulate contaminants from natural and industrial sources. These methods allow the non destructive analysis of individual particles, ranging in size from 0.01 to 1000 micron, for elemental and mineralogical content. Methods developed include transmission electron microscopy, scanning electron microscopy, electron probe microanalysis, x-ray diffraction, optical mineralogy, and density measurement. (Author abstract modified)

23363 APTIC NO. 42303

Breuer, Wolfram

MEASUREMENT OF TRACE GASES - PRESENT STATE AND DEVELOPMENTS. *(Stand und Entwicklung der Gasspurenmessung). Text in German. Chem.-Ing.-Tech., 44(10):643-655, 1972.*

The methodological problems encountered in determining the concentration of atmospheric pollutants are characterized by the very low and widely varying concentrations involved and the many situations occurring in practice, each of which requires development of an optimal measurement strategy and system for measurement and evaluation. A brief review is given of the fundamental demands on analytical techniques and the emission measurement program operated by Farbenfabriken Bayer A. G. in Leverkusen, West Germany is considered as an example of planned development. Future analytical methods and equipment must be able to take exact measurements within a concentration range of 0.000001 and 10 to the minus 9th power. The analysis of a specific component must be feasible without interference by other present components. The equipment must be reliable and simple to handle and it must be independent of the mains. For emission measurements many specific chemical reactions and physical effects are used. Units based on electrolytic measurements are most efficient. A newly developed diffusion cell is shown where the gas diffuses through a filter. The molecules of the trace component react on the electrolyte surface and disappear. The entirely battery-operated trace gas measuring unit is small and can be connected to a recorder. Several other electrolytic measurement units are also shown.

23364 APTIC NO. 43176

Brown, R. M., L. A. Cohen, and M. E. Smith

THE DIFFUSION OF LARGE PLUMES. *Preprint, American Meteorological Society, Boston, Mass., and Air Pollution Control Assoc., Pittsburgh, Pa., 3p., 1971. 3 refs. (Presented at the Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-7, 1971.)*

An optical densitometer used for providing diffusion information on large plumes was tested during 18 airborne runs. The instrument is mounted on an aluminum base plate which can be installed in an aircraft. It consists basically of a light source, two sets of lenses for collimation, a light-tight compartment, a detecting device, and a recording mechanism. The instrument utilizes 90 deg light scattering from particles in the range 0.01 to 10 micron which are drawn through the detecting unit from the ambient air. The response of the densitometer is governed by the light flux from the bulb and the stray light reflections within the detecting chamber. The densitometer is calibrated before each use with a known concentration of oil fog particles in a room about 222 cu m in volume. The unit is capable of detecting 5 micrograms/cu m of 0.6 micron particles, and its sensitivity and speed of response (5 secs) can be used to determine background concentration of particles in the air; it is most useful in measuring plume geometries in diffusion studies. Calibration curves, background concentrations, plume trajectories, and three-dimensional plume cross sections are illustrated.

23365 APTIC NO. 43568

Bufalini, J. J., S. L. Kopczynski, and M. C. Dodge

CONTAMINATED SMOG CHAMBERS IN AIR POLLUTION RESEARCH. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Div. Chemistry and Physics, 12p., 1971. 15 refs.*

Interlaboratory comparisons of various smog chambers indicated poor quantitative agreement in the results of the irradiation of simple model systems. A dirty chamber may be responsible for the observed disagreement. The effects of contaminated chamber walls were evidenced in the photooxidation of biacetyl and tetramethylenthylene. Ozone was observed when biacetyl was irradiated in the presence of oxides of nitrogen or when irradiated in a dirty chamber. When photodissociated in a clean borosilicate flask, with no oxides of nitrogen present, ozone was not observed. Tetramethylethylene when irradiated in a dirty borosilicate flask underwent reaction. No reaction occurred in a clean flask. As long as chamber walls are not cleaned between runs, contaminants will be liberated and the problem of agreement in results from various smog chambers will remain. (Author abstract modified)

23366 APTIC NO. 43288

Burton, Robert M., James N. Howard, Robert L. Penley, Peggy A. Ramsay, and Thomas A. Clark

FIELD EVALUATION OF THE HIGH-VOLUME PARTICLE FRACTIONATING CASCADE IMPACTOR- A TECHNIQUE FOR RESPIRABLE SAMPLING. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 33p., 1972. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972.)*

A four-stage, multiorifice, high-volume fractionating cascade impactor with backup filter, which can be operated as a component of the standard Hi-Vol sampler, separates particulate matter into five aerodynamic size ranges: 7 micron or larger; 3.3-7 micron; 2.0-3.3 micron; 1.1-2.0 micron; and 0.01-1.1 micron. Field tests utilizing duplicate sampling techniques in comparative tests were conducted to determine the feasibility of using the fractionator on a routine basis in field operations. A glass fiber collection medium with a pH of 11.0 adsorbed atmospheric acid gases during sampling and should not be used if results comparable to those obtained with the standard Hi-Vol sampler are desired. Glass fiber filters with a pH of 6.5 will eliminate the acid gas adsorption. (Author abstract modified)

23367 APTIC NO. 43677

Byers, R. Lee, Douglas W. Cooper, and John W. Davis

A STUDY OF THE EFFECTS OF AEROSOL PROPERTIES ON SCATTERING OF LASER LIGHT. (FINAL REPORT). *Pennsylvania State Univ., University Park, Office of Air Programs Contract CPA 70-103, Rept. APTD-0796, 152p., July 1, 1971. 44 refs.*

NTIS: PB 204356

The influence of several variables on the backscattering of laser light by aerosols was studied. Helium-neon light was used to illuminate aerosol particles generated by a Collison atomizer. The backscattering of light by the particles was measured as a function of relative humidity. Depolarization and field studies were also made. Potassium chloride, sodium chloride, and sodium bromide particles all scattered more than twice as much light after becoming droplets. The change in phase occurred at lower humidities than those appropriate for the bulk material. These salt particles depolarized 13 to 25% of the incident polarized light intensity when dry particles, and 6-12% of the incident light when droplets. The effect of changing ambient relative humidity was also studied for methylene blue dye and uranine dye particles. Depolarization measurements were also made for polystyrene latex and dioctyl phthalate aerosols. The laboratory device which measured the backscattering from the aerosols was used in a field test along with a lidar device. The field test, while not conclusive, indicated that relative humidity did affect lidar measurements. (Author abstract modified)

23368 APTIC NO. 42437

Cate, J. L., Jr.

DETERMINATION OF LEAD, ARSENIC, CADMIUM, MERCURY, AND SELENIUM IN AIR SAMPLE FILTERS BY X-RAY FLUORESCENCE ANALYSIS. *California Univ., Livermore, Lawrence Radiation Lab. Contract Atomic Energy Commission W-7405-Eng-48, 13p., Nov. 15, 1971. 5 refs.*

NTIS: UCRL-51038 Rev. 1

X-ray fluorescence offers a quick, accurate, sensitive, and nondestructive means of assaying the lead burden of air-sample filter papers. A radioisotope source of low energy photons (or other ionizing radiation) is used to ionize the constituent atoms of the sample. These atoms then emit characteristic (fluorescent) x-rays. These x-rays are detected by an energy-sensitive detector; their energy is unique for each element, and their intensity is related to the concentration of each species in the sample. Since the air-sample filters used in a local sampling program were of constant size (6.6 sq cm.), severe collimation to define the irradiated area was not needed. Consequently, the original collimator assembly was redesigned to improve system sensitivity. Three sets of test specimens were prepared; each set included a filter containing 0, 1/2, 1, 2, 5, 10, 50, and 100 micrograms lead/sq cm. Each of the 24 standards was counted at least 15 times for a period sufficient to accumulate at least 1000 (and generally greater than 3000) total counts. The calibration results from these lead standards are presented in both tabular and graphical form. The data represent an artificial situation: a filter containing lead without any of the other materials normally present in an air sample. These other materials may affect the measurement by altering the scattered radiation or by direct interference. By judicious selection of techniques, most interferences can be circumvented, although perhaps with some loss of sensitivity. New data for the determination of arsenic, cadmium, mercury, and selenium are given in the appendix.

23369 APTIC NO. 42823

Chan, S. H., J. F. Moore, M. J. D. Low, and P. S. Jagannathan

MEASUREMENTS OF INFRARED RADIATION PROPERTIES OF GASEOUS POLLUTANTS BY A HIGH TEMPERATURE, HIGH PRESSURE, LONG PATH CELL. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 4p., 1972. 20 refs. (Presented at the American Institute of Aeronautics and Astronautics Thermophysics Conference, 7th, San Antonio, Tex., April 10-12, 1972, Paper 72-276.)*

The infrared absorption of gaseous pollutants was measured by an absorption cell which employs multiple-relection optics and can be operated at high temperature (room temperature to 558 K), high pressure (vacuum to 3000 lb/sq in), and long path (4 to 48 meters) conditions. Measurements were made at room temperature and at total pressure equal to or less than one atm. Results of low resolution measurements are presented for most of the important infrared bands of four air pollutants: sulfur dioxide, nitric oxide, ethylene, and nitrogen dioxide. (Author abstract modified)

23370 APTIC NO. 42398

Chapman, Robert L.

TESTING AND PERFORMANCE CHARACTERIZATION OF COMMERCIAL AIR POLLUTION MONITORS. *Preprint, 4p., 1971. (Presented at the Reliability and Maintainability Conference, Annual, 10th, Anaheim, Calif. June 28-30, 1971.)*

The requirements of commercial air pollution monitors are quite similar to those of general industrial analytical instrumentation; they should be commercially available, reasonably priced, accurate, capable of continuous unattended operation, and compatible with data acquisition systems. The basic types of gaseous pollutants for most frequent monitoring include carbon monoxide, hydrocarbons, sulfur dioxide, nitric oxide, nitrogen dioxide, and oxidants. All analytical instruments should be standardized daily; all monitoring instruments should be checked, serviced, and calibrated methodically, according to the manufacturer s instructions, semi annually. Reputable instrument manufacturers put all of their commercial products through a rigorous testing program before they are released to market. A typical outline for commercial instrument testing consists of electrical tests including determining the effects of variation in line voltage and frequency for AC instruments; environmental tests to assure that the instrument will perform within specifications through the full range of ambient temperature and humidity; life tests involving a full year of operation under normal operating conditions; packaging tests to ensure that the instrument will reach its destination unharmed; case and control temperatures test to assure that no exposed parts of the instrument will become unduly hot under any condition of operation; and safety tests to insure that the instrument poses no hazards to personnel. Application evaluation further tests the instrument for performance, compatibility to peripheral equipment, suitability, ease of installation, and convenience of controls.

23371 APTIC NO. 43192

Chase, D. L., D. L. Sgontz, E. R. Blosser, and W. M. Henry

DEVELOPMENT AND EVALUATION OF AN ANALYTICAL METHOD FOR THE DETERMINATION OF TOTAL ATMOSPHERIC MERCURY. (FINAL REPORT). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract EHSD 71-32, APTD-1174, 66p., June 16, 1972. 23 refs.*

NTIS: PB 210822

The experimental procedures leading to the development of an analytical method for the determination of organic and inorganic mercury in the ambient air, evaluation techniques, equipment, calibration, efficiency tests, construction details, and test results are examined. The chemical absorption method involving iodine monochloride, while capable of collecting various forms of mercury, presented severe contamination and analytical problems. A pyrolysis-amalgamation technique, using a silver wool collector and a catalytic pyrolysis furnace, gave good revcovery of mercury and was amenable to straightforward chemical analysis. Two commercial instruments were also evaluated. The particle counting method proved unreliable, but the instrument using the 253.7 nm Hg optical absorption line was quite accurate for the determination of elemental mercury in the air. (Author abstract modified)

23372 APTIC NO. 43148

Chatfield, E. J.

A SIMPLE PARTICLE SIZE COMPARATOR. *J. Sci. Instr., vol. 44:615-617, Aug. 1967. 7 refs.*

A description is given of a simple comparator which allows the measurement of particle size distribution by unskilled operators. The instrument is designed to accept a 35 mm photograph of the particulate material, produced by an optical or an electron microscope. The photograph is projected on to a translucent screen and particle sizes are compared with a superimposed spot of light projected from the other side. Adjustment of the spot diameter automatically ensures that when the particle is counted by operation of a foot switch it is also placed into the appropriate size category. The performance is illustrated by a typical size distribution determination, performed by both experienced and untrained operators. All operators were able to size particles at speeds in excess of 30/min. (Author summary modified)

23373 APTIC NO. 43501

Chavdarova, R.

SPECTROPHOTOMETRIC DETERMINATION OF SO2 AND SULFITES WITH ALKALINE NITROPRUSSIDE. *(Ueber die photometrische Bestimmung von Schwefeldioxyd und Sulfiten mit alkalischem Nitroprussid). Text in German. Compt. Rend. Acad. Bulgare Sci., 23(10):1263-1266, 1970. 9 refs.*

A method for the spectrophotometric determination of sulfur dioxide and sulfites is described. The reagent, constituting a modification of the Bourbon-Malbosc reagent, consists of pyridin, zinc acetate, glycerin, and aqueous sodium nitroprusside solution. This reagent gives particularly intense coloration in the presence of sulfur trioxide ions, and the difference in the extinction for the two different reagents lies at about 26%. The pH is adjusted to 5.5. The coloration is stable over about two hours in darkness. The Lambert-Beer law is valid in a range of 0.5-18.8 micrograms/cu cm. Air samples are taken by using zinc acetate and glycerine as absorber. The spectrophotometric method, insensitive for small quantities of bases, acids, nitrogen oxides, nitryls, fluorides, and hydrogen sulfide, is suitable for SO2 and sulfite determination in air and food.

23374 APTIC NO. 42729

Cheesman, G. H. and H. M. Kirkby

AN AIR DILUTION OLFACTOMETER SUITABLE FOR GROUP THRESHOLD MEASUREMENTS. *Quart. J. Exp. Psychol., vol. 11:115-123, 1959. 10 refs.*

An air dilution olfactometer suitable for group threshold measurements, which keeps a series of smelling points independently supplied with constant controlled concentrations of odorous material, is described. The device consists of an air supply cylinder; an air-cleaning device to ensure that the air used is free of odor; a saturator to provide a fixed upper concentration of odorant; and a series of diluting devices supplying the appropriate concentration to each smelling point. The behavior of each portion of the device was studied quantitatively and the complete device provided a series of accurately

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controlled and steady concentrations of odorous vapor. Five full olfactory tests were made before the olfactometer was dismantled.

23375 APTIC NO. 43188

Chen, Tio C.

MOTOR VEHICLE GENERATED AIR POLLUTION REVIEW AND EXTENSION OF METHODOLOGY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1972. 17 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-142.)*

An overview is presented of the air pollution aspect of environmental impact analysis for proposed highways, including the considerations which must enter into the selection of an analytical model for predicting pollutant distribution in the air basin of proposed highways. The inadequacy of proposed air quality standards and the inconsistency of Federal and state air quality standards are discussed. The inadequacy of current models for air pollution prediction is reviewed with reference to an exact model. Furthermore, the inadequacy of integration of current models with proposed air quality standards is explored in terms of available input data for pollution models and the required output for environmental impact statements. The difficulties of presenting findings and of defining the environmental impact of proposed highways are presented. Appropriate approaches to improving these issues are proposed. For a proper presentation of environmental impact statements, certain types of concentration curves for pollutants are introduced to enable a meaningful comparison between the predicted pollution levels and Federal and state air quality standards. Speculation on the usefulness of these type of curves to the analysis of human response will serve to highlight the adequacies of proposed analytical approaches of modeling an air basin for pollutant distribution on proposed highways. (Author abstract modified)

23376 APTIC NO. 42735

Clark, G. L. and H. C. Terford

X-RAY ANALYSIS OF FOUNDRY DUSTS. FLUORESCENT SPECTRAL ANALYSIS FOR IRON. *Anal. Chem., 26(9):1416-1418, Sept. 1954.*

Because of the importance of iron determinations in foundry dusts in the diagnosis of siderosis, as contrasted with silicosis, and because of the extremely laborious and unsatisfactory analysis by most chemical methods, recourse must be taken to fluorescent spectral analysis. Foundry dusts were analyzed with the General Electric SPG fluorescent spectrometer with the XRD-3 x-ray diffraction unit. The calibration curve is considered.

23377 APTIC NO. 43243

Cochrane, T. S.

ROUTINE DUST MEASUREMENTS AND STANDARDS. *Can. Mining Met. Bull. (Montreal), 65(717):46-50, Jan. 1972. 5 refs. (Presented at the Canadian Mining and Metallurgical General Meeting, Annual, 73rd, Quebec City, Quebec, April 1971.)*

Measurement methods and proposed standards for dust emission determinations in mines are reviewed. Basic considerations for choosing one method above another are examined. The non-selective sampling and assessment techniques include open filters, high volume filters, membrane filters, filter fabrics, gravimetric methods, thermal precipitators, photoelectric measurements, and electrostatic precipitators. For selective measurement of respirable dust particulates, the linear and aerodynamic methods include impingers, konimeters, thermal precipitators, microscopic techniques, tyndalloscopes, sedimentation techniques, light scattering measurements, cyclone-filters, gravimetric methods, diffraction size frequency analyzers, selective samplers, x-ray diffraction, and infrared spectrospcopy. Standards for dust emissions and air quality in mines and for sampling frequency are considered with respect to dust, exposure, and dosage indices.

23378 APTIC NO. 42706

Cook, Charles S. and George W. Bethke

THE REMOTE MEASUREMENT OF SMOKE PLUME TRANSMITTANCE USING LIDAR. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C. Air Pollution Control Office and General Electric Co., King of Prussia, Pa., Space Sciences Lab., 26p., 1971 (?). 8 refs. 42363 Cukor, Peter, Leonard L. Ciaccio, Edward W. Lanning, and Robert L. Rubino SOME CHEMICAL AND PHYSICAL CHARACTERISTICS OF ORGANIC FRACTIONS IN AIRBORNE PARTICULATE MATTER. Environ. Sci. Technol., 6(7):633- 637, July 1972. 49 refs. (Presented at the Division of Water, Air, and Waste Chemistry Meeting, 162nd, Washington, D. C., Sept. 1971.)*

Organic constituents in airborne particulate matter were recovered by the benzene extraction of hi-vol sample filters located adjacent to a major highway intersection in New York City. The organic constituents were separated by silica gel chromatography into three fractions: hexane-benzene (34%), chloroform (46%), and 2-propanol (20%). Gel permeation chromatography shows all the fractions to contain substances with a range of molecular weights of 100-2300, with an average of 310-350. From elemental and ir characterization, long-chain aliphatic hydrocarbons were found in the first fraction, and polymerized oxidized unsaturated hydrocarbons in the second and third fractions. A comparison between the last two fractions and a model compound showed great similarity in molecular weight distribution between organic particulate matter and substances found in used lubricating oils. The chemical characteristics indicate that the particulate emissions collected and examined arise from the internal combustion engine.

23379 APTIC NO. 43523

D. Aubigne, J. Merle, C. Landault, and G. Guiochon

METHODS OF PREPARATION OF CAPILLARY COLUMNS USED IN GAS CHROMATOGRAPHY. I. TRUE CAPILLARY COLUMNS. *(Methodes de preparation des colonnes capillaires utilisees en chromatographie en phase gazeuse. I. Colonnes capillaires vraies). Chromatographia, vol. 4:309-326, 1971. 62 refs. Translated from French. 56p.*

Various problems encountered in the preparation of capillary columns and in their use are discussed. In order to obtain good capillary columns, it is necessary that the distribution of stationary phase droplets on the inside walls of the columns be uniform and that the surface of the glass be as uniform as possible. A simple and rapid method for determining the possible origins of poor analytical results is presented, and the various factors that may influence the choice of the capillary tube, the treatment to be applied, and the method of depositing the stationary phase are discussed. The advantages and disadvantages of the two principal coating methods, static and dynamic, are also compared. Tests are described by which the quality of a column and of its treatment, as well as its capacity for resolving polar or non-polar mixtures, can be determined. (Author abstract modified)

23380 APTIC NO. 42989

Daniel, J. H. and F. S. Brackett

AN ELECTRICAL METHOD FOR INVESTIGATING THE NATURE AND BEHAVIOR OF SMALL, AIRBORNE, CHARGED PARTICLES. *J. Appl. Phys., 22(5):542-554, May 1951. 14 refs.*

A theoretical and experimental analysis of the current-voltage characteristic of a parallel-plate condenser through which the small, airborne, charged particles of an aerosol are continuously passed shows that a charge-weighted distribution of radius- or radius squared-charge ratio may be obtained when certain experimental conditions are satisfied. Examination of such a distribution for an aerosol of particles less than a micron in diameter before and after passage through a small (20-liter) settling chamber shows that the classes of particles in the distribution that are easiest to collect in the condenser are also the classes that disappear most rapidly in the chamber. The methods employed would become less tedious and more powerful when used with a dispersion of constant size particles, and they are well adapted for certain fundamental investigations of aerosol properties. Application of the method to silica and water aerosols is considered. It is necessary to have information on such physical characteristics as the mass and charge distributions, and the state and rate of aggregation of the particles composing an aerosol, in order to evaluate properly the results of experiments on the physiological effects of inhaled aerosols. (Author abstract modified)

23381 APTIC NO. 43509

Deuber, Arnold, Alfred Gilgen, and Etienne Grandjean

METHODIC STUDIES FOR DUST SEDIMENTATION MEASUREMENT. *(Methodische Untersuchungen zur Staubniederschlagsmessung). Text in German. Staub, Reinhaltung Luft, 29(4):148-152, April 1969. 26 refs.*

Methodical studies were carried out on a Bergerhoff adhesive foil type dust sedimentation measuring instrument which was found to be superior to other methods regarding reliability, comparability, and expenditure. Total conversion of sulfite and nitrite ions into sulfate and nitrate ions inside the instrument within 6-8 days was observed. While the water-insoluble fraction was not affected, the water-soluble fraction, total dust, and hydrogen ion concentration in the fluid increased with increased collecting fluid amount, which indicates that the use of collecting fluid, though not stabilized at a given level, is advisable. An additive such as 2-methoxy-ethanol in an amount of 5% by volume should be used as an anti-freeze and microorganism-controlling agent. Since it is difficult to set up sampling points at ground level, tests at 2 m above the roof are recommended. A method omitting requirements on the value distribution showed that a minimum of three to four measurements must be carried out to obtain an accuracy of 10%.

23382 APTIC NO. 43467

Dietz, Russell N. and Edgar A. Cote

GAS CHROMATOGRAPHIC DETERMINATION OF SULFUR HEXAFLUORIDE FOR TRACING AIR POLLUTANTS. *Am. Chem. Soc., Div. Fuel Chem., Preprints, 10(2):209-215, 1971. 7 refs.*

An improved method for determination of less than one part sulfur hexafluoride in 10 to 13th power parts of air without preconcentration or elaborate carrier gas purification uses a Varian Aerograph Model 1523-2B equipped with an isothermal power proportioning controller, dual differential electrometer with 10 to the minus 10th power amps/mv sensitivity, and a concentric tube-type 250 mCi tritium foil electron capture detector maintained at 100 C and 65 VDC, and a nitrogen ultrapure carrier gas flow rate of 14 cc/min. A 1 mv dual channel Varian model 20 recorder was equipped with a disk integrator and a low pass noise filter with two 3000 ohm resisters and a 100 microfarad capacitor at the input terminals. Both 3 ft and 17 ft gas chromatography columns contained 5 A molecular sieves prepared with nitric oxide. Mixtures of SF6 in nitrogen were used to calibrate the instrument. Samples can be analyzed every 5 min. Plume analyses attained a standard deviation of 60%. Real- time analysis is possible using a portable gas chromatograph.

23383 APTIC NO. 43587

Duke, Charles R. and Boong Y. Cho

DEVELOPMENT OF A NUCLEONIC PARTICULATE EMISSION GAUGE. (FINAL REPORT). *Industrial Nucleonics Corp., Columbus, Ohio, Federal Systems Div., Environmental Protection Agency Contract 68-02-0210, APTD-1150, 62p., Feb. 25, 1972.*

NTIS: PB 209954

The principles of operation, design criteria, filter selection, and field test data for a beta gauge and filter sampler for the measurement of particulate emissions from automobile exhaust are examined. The system has a minimum sensitivity of 125 micrograms/cu m with no specified upper limit; is capable of operation in either a manual or automatic mode; and has a filter collection system with an efficiency of at least 99.9% using a dioctyl phthalate aerosol. Carbon-14 was selected as the optimum isotope, and a filter cassette was used to collect the particles. The effect of moisture absorption by various types of filter media was investigated. The system was tested on automobiles using leaded, low-lead, and non-leaded fuels. Results from the leaded and low-lead fuel tests were in good agreement with gravimetric measurements; less desirable results were obtained with the no-lead fuels. Complete operating procedures and variables and test results are included.

23384 APTIC NO. 42785

Edwards, William H., A. Clyde Hill, and Wayne O. Ursenbach

APPLICATION OF SCANNING ELECTRON MICROSCOPY TO IDENTIFICATION AND ESTIMATION OF NATURAL AND MAN-MADE DUSTS IN ARID REGIONS. *Chemosphere, 1(3):107-112, May 1972. 8 refs.*

In the arid western U. S., where a major expansion of coal-fired electric generating stations is occurring, wind often entrains significant quantities of natural dusts which at times exceed all standards several fold. Coupled with the development of the Nucleopore filter with its smooth face, the electron microscope provides an excellent tool for the identification of species existing in particulate samples from the arid west. Particulate samples were collected on Nucleopore filters around isolated coal-fired electric power generating stations and in areas remote to industrial activity to determine the distributions of fly ash and natural dust. The filters were then shadowed with gold and examined under the scanning electron microscope, obtaining random photographs at 1000X and 5000X magnification. From these pictures, the actual particles observed were identified and counted according to the particle size range. These data were used to determine number and weight distributions and to estimate the relative contribution of the various particulates to light scattering.

23385 APTIC NO. 43242

Effenberger, Ernst

COMPARABILITY OF MEASUREMENT RESULTS FROM THE MOST IMPORTANT INSTRUMENTS FOR MEASUREMENT OF PARTICULATE PRECIPITATIONS. *Staub (English translation from German of: Staub, Reinhaltung Luft), 31(12):31-38, Dec. 1971. 8 refs.*

NTIS: TT 71-50113/12

The most important criteria to be met by a standard instrument for the measurement of particulate precipitation are reviewed. The measured particulate precipitation should be as close as possible to the absolute value of dust fall. Two measurement methods and results of determination were compared to determine the most accurate method of converting the particulate precipitation measurement results of one instrument to the result of the standard instrument. The marked disparity between the conversion factors depends on the considerable variations in measuring results, which may change from one measuring point to the other and with respect to time as a result of weather conditions. For approximate conversions, the followig factors are sufficient: measuring result (st) equals 1.40

times measuring result (L); and measuring result (st) equals 1.09 times measuring result (H).

23386 APTIC NO. 43137

Egenback, K. -E.

COMPARISON OF EXHAUST EMISSIONS FROM DIFFERENT SIZE AUTOMOBILES AS TESTED ACCORDING TO ECE- AND USA-TESTS. *(Jamforelse av avgasutslappet fran bilar av olika storlek testade enligt ECE-test och USA-test). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-24, 12p., Sept. 11, 1968. 2 refs.*

The influence of the stroke volume - weight ratio on the ratio of the exhaust measurements data as obtained from ECE and USA-tests was studied. The ECE-test provides no distinction between emissions from cold and warm cars since some cars, particularly such with great stroke volume, would show high emission during start-up and low emissions when warm. As cars with great stroke volume relative to their weight have no time to reach their stable operating temperature during ECE-test, ECE-test results should be compared to such obtained during the 1-4 cycles of the USA-test. The differences in the load conditions as specified by the USA and ECE-tests are another factor to be considered when comparing the two different test results. The ECE cycle provides a longer no-load period than the USA cycle (49.3% as against 46.7%), while the acceleration periods are 21.5% in the ECE and 31.4% in the USA cycle. The respective constant drive periods for the ECE and USA cycles are 29.2% and 21.9%. The carbon monoxide and hydrocarbon measurement data as obtained from ECE and USA tests show a relatively wide spread, and as only few relatively big cars were tested, no distinct tendency was found. It can be expected that increased stroke volume to weight ratios will cause CO(ECE) to CO(USA) as well as hydrocarbon(ECE) to hydrocarbon(USA) ratios to rise, particularly for cold start.

23387 APTIC NO. 42643

Fielding, George H. and A. Stamulis

AERODYNAMIC DEPOSITION OF AEROSOLS ON LARGE BLUFF OBJECTS IN NATURAL WINDS: AN EXPERIMENTAL APPROACH. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 404-406. 4 refs. (Dec. 6-11, Paper CP 13D.)*

A new approach to the prediction and understanding of aerosol deposition on large bluff objects in natural winds utilizes a very small evaporator for direct measurement of a viscous sublayer thickness and indirectly, a degree of turbulence. Optical and gravimetric methods are used for measuring the quantity of liquid evaporated. The former is approximate only and depends on the change in the degree of transparency of the wetted paper disc as the liquid evaporates. The more accurate gravimetric method involves removal of the evaporimeter from the surface at a known time, wrapping it in aluminum foil, and placing it in a small container for transfer to the laboratory where it is unwrapped, weighed together with the pan, and weighed again when all the liquid has evaporated. These two weighings, together with the original weight deposited in the paper via syringe, and the measured period of evaporation, allow calculation of the average evaporation rate.

23388 APTIC NO. 42878

Fink, Roland and Jochim Zajontz

INVESTIGATIONS OF THE CONTINUOUS MEASUREMENT OF GAS VOLUME AND EXHAUST GAS ANALYSIS OF THE SPARK-IGNITION ENGINE. *(Untersuchungen zur kontinuierlichen Gasmengenmessung und Gasanalyse am Ottomotor). Text in German. Deut. Kraftfahrforsch. Strassenverkehrstech., no. 217:1, 1971. 216 refs.*

The collective bag method of exhaust gas testing, used in Europe, permits determination of carbon monoxide and hydrocarbons on motor cars with spark ignition engines in a relatively simple manner. Nitric oxides, however, for which European regulations have until now not imposed any limitation, could not be determined accurately with the collective bag method, since the nitric oxide in the exhaust gas partly combines with residual oxygen in the bag to form nitrogen dioxide. This has been remedied by the development of a continuous method of gas analysis, in which non-dispersive infrared measuring devices are being used for determining the concentrations of CO, carbon dioxide, hydrocarbons, and NO, whereas NO2 is measured with a Beckman flow-through photometer. The volumetric measuring of the exhaust gas flow is effected either with a hot wire anemometer, or with a twist-flowmeter. While the collective bag method provides information only about the total emission of harmful gases, the continuous method permits measurement of gas volume and of concentration of emissions in any part of the test run.

23389 APTIC NO. 42902

Freedman, Robert W.

ANALYSIS OF FREE SILICA IN RESPIRABLE DUST. *Bureau of Mines Information Circ., no. 8521:1-8, Aug. 1971. 13 refs.*

Existing and proposed chemical and spectroscopic analytical procedures for coal and noncoal dusts are reviewed. A medical distinction is made between the various forms of free silica because of differences in toxicity. This survey considers only free silica in the respirable range, i.e., of the particle size between 0.1 and 5 micron. In coal mines, free silica exists mainly in the form of crystalline quartz. The respirable dust in the mine is contaminated, to a great extent, by rock dusts, which include calcium carbonate and calcium magnesium carbonate, and to a lesser extent by clay minerals from rock and slate. Current methods of analysis demand ashing of the sample to remove organic matter and to concentrate the quartz. Analysis of free silica is limited in sensitivity and precision by the small amounts of sample available as collected by size-selective personal respirable dust samplers. Absorbance varies with particle size, in infrared and X-ray diffraction analysis. The size distribution within samples of respirable dust collected with a given type of size-selective sampler varies in a predictable way. However, a simulation of actual samples by grinding known materials, such as analyzed coal, is almost impossible. Bulk samples of settled coal dust can be analyzed by X-ray diffraction; the size range is very broad, and only a small weight fraction is in the respirable size range. The analysis of respirable dust collected on membrane filters is conducted routinely by infrared analysis only. Many of the principles involved in coal mine dust analysis apply to the analysis of the dust collected in noncoal mines; rock dust used for inerting coal dust layers against explosion can be similarly analyzed for free silica. Laser Raman spectroscopy may be of value in analyzing ashed samples of noncoal dust since peaks resulting from vibrations may be available which are infrared insensitive.

23390 APTIC NO. 42794

Fugas, Mirka, Mirjana Gentilizza, and B. Wilder

ON THE MEASUREMENT OF ATMOSPHERIC SULFUR DIOXIDE. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D.C., 1970, p. 383-386. 4 refs. (Dec. 6-11, Paper CP 7F.)*

Several conventional methods for measuring atmospheric sulfur dioxide are reviewed and evaluated. The West Gaeke method occasionally fails to give reliable results in the analysis of 24 hr samples, and the attempted conductometric correction of the acidimetric method is even less satisfactory. The sulphate method, believed to yield true concentrations of SO2, is expensive. Taking into account the simple procedure and

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low costs involved, the acidimetric method may be used in spite of its shortcomings. An attempt was made to establish a method for obtaining rough estimates of the maximum and mean daily concentrations of atmospheric SO2 on the basis of the results of two air samples of short duration. A great number of continuous 10-min SO2 recordings were performed. The analysis showed that under steady meteorological conditions there was a standard diurnal SO2 concentration pattern. Under these conditions the afternoon SO2 maximum was a fair approximation of the mean daily concentration, while the morning maximum was a fair approximation of the maximum concentration in the course of a 24-hr sampling cycle. The optimum time for sampling, leading to the lowest estimated error, was found to be 8-10 AM for the morning sample and 3-6 PM for the afternoon sample. The concentration ratio between the morning and the afternoon sample has been found to characterize the diurnal SO2 concentration pattern.

23391 APTIC NO. 43479

Gilbreath, R. H., Jr.

SAMPLE SYSTEMS FOR ON-LINE SOURCE MEASUREMENTS OF PULP MILL WASTE GASES. *Technical Assoc. of the Pulp and Paper Industry, New York, Tappi Eng. Conf., 26th, Proc. 1971, p. 581-594. 9 refs.*

Controlled conditioning of representative waste gas samples for on-line composition analysis of pulp mill waste gases is the prime function of a properly designed sampling system. The sample system design is influenced by selection of final analysis instrumentation, source stream compositions, and physical locations of the sampling probe. The system must maintain constant temperature, pressure, and flow of the gas sample stream. Undersirable stream components must be removed if their presence diminishes and analysis instrumentation sensitivity. Probe design and placement and the components and functions of the gas sampling system are described. Typical kraft mill waste gas compositions are presented.

23392 APTIC NO. 43469

Gilby, A. C.

A PORTABLE INFRARED SPECTROMETER WITH LONG PATH CELL FOR AMBIENT AIR AND GAS ANALYSIS. *Preprint, 26p., 1971. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Pittsburgh, Pa., Feb. 28-March 5, 1971.)*

A small infrared spectrometer with a sensitivity extending to fractional ppm in described. The spectrometer in single beam, with energy from a nichrome wire source focused through a 50 Hz chopper and a circular variable narrow-band pass filter onto a slit. The pass band can be varied from 2.5 to 14.5 micron by rotating the filter wheel. The aperture of the beam at the slit is f/1.5, which means considerably higher energy through put than in conventional spectrometers. Specifications of the long path cell are described. The output signal is a DC voltage displayed on a meter or external chart recorder, with great flexibility in choosing what part of the signal to display. The scale can be expanded up to 20 times and the zero depressed by any amount. The amplifier has a gain range of 70:l. The theory of infrared spectrometry is discussed both in general terms and with regard to specific functions and limitations of the spectremeter.

23393 APTIC NO. 42997

Glass, J. S.

FILTER EFFICIENCY STUDIES USING IMAGE ANALYZING TECHNIQUES. *Chem. Eng. Progr., 68(1):58-61, Jan. 1972.*

Principles of operation of a particular image analyzer, the IIMC Particle Measurement Computer System, are described, as well as its utility for filter efficiency studies. Typically, the samples are quantitatively collected on a membrane filter, which is then rendered transparent and mounted on a microscope slide which, in turn, is placed under the microscope. The aerial image produced by the objective is focused on the vidicon tube portion of the camera system which is attached to the photo-offtake of the microscope. The microscope image is scanned and the analog video signal goes to a solid state digital computer which applies counting and sizing logic to it, then sends the original video signal, to which the results of measurement have been added, to the television monitor. Before they can be analyzed, the particle images must be sensed by the camera system and their boundaries defined. For this reason, an analog decision making process, thresholding, must be embodied in such an instrument. Counting logic and area measurement are discussed.

23394 APTIC NO. 42340

Goretti, G. and A. Liberti

HIGH-RESOLUTION GAS-CHROMATOGRAPHIC STUDY OF DIESEL ENGINE EXHAUST GAS. *(Esame dei gas di scarico dei motori Diesel mediante colonne gascromatografiche ad alta risoluzione). Text in Italian. Riv. Combust. (Milan), 26(3):126-131, March 1972. 4 refs.*

Ether extracts from the aqueous condensate and from particulate matter in diesel engine exhaust gas were analyzed in glass capillary columns, coated with a free fatty acid phase or with trimer acid. About 400 compounds were detected, and partial identification by means of the retention index showed that about half of them were hydrocarbons and the other half oxygenated compounds that might be involved in exhaust gas odor. The identified compounds included phenol, benzaldehyde, benzyl alcohol, acetophenone, isobutyl acetate, butyric acid, and valeric acid.

23395 APTIC NO. 43309

Goshgarian, B. B. and W. C. Solomon

NOZZLE BEAM-MASS SPECTROMETER SYSTEM FOR STUDYING ONE-ATMOSPHERE FLAMES. *Air Force Rocket Propulsion Lab., Edwards AFB, Calif., TR-72-30, Proj. 644A08ML, 40p., April 1972. 11 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, WSCI 72-9.)*

A nozzle beam-mass spectrometer system for sampling one-atmosphere flames is presented in detail. The performance of the device in sampling premixed flames was demonstrated using methane-oxygen- argon flames. The mass spectrometer analyzer was operated with an electron energy of 20 electron volts in order to reduce fragmentation of flame gases. Near-equilibrium flame conditions were observed. The concentrations of combustion products have been measured and certain combustion intermediates have been observed while translating the probe through the flame zones. Spatial resolution within the flame zones was good, the latter being on the order of 0.1 mm. This device is currently under investigation with respect to its behavior as a tool in sampling rocket nozzle exhausts and high-pressure flow reactors.

23396 APTIC NO. 43680

Graff, William R. and I. H. Suffet

DIAGNOSIS OF AIR POLLUTION BY MICROWAVE SPECTROSCOPY. *Int. J. Environ. Anal. Chem., vol. 1:327-342, 1972. 51 refs. (Presented at the Canadian Chemical Conference, 54th, Halifax, May 31-June 2, 1971.)*

Results of experiments concerning adapting spectroscopy techniques to detection of gaseous pollutants in the atmosphere, are presented. A review is made of the current situation of microwave spectroscopy and of the feasibility of using this technique in the detection of gaseous pollutants in air. The possibility of applying ultraviolet, visible, and infrared spectroscopic methods to the microwave region is investigated. Basic measurements are being made to determine limits of pressure over which small concentrations of pollutants may be measured in air. Methods are being investigated for adapting the techniques of microwave spectroscopy to the detection of gaseous pollutants. Specifically, it is desired to develop an instrument which will quantitatively detect pollutants at atmospheric pressures. This instrument may be incorporated in a system for air pollution monitoring over large expanses from remote stations, or stack monitoring. (Author abstract)

23397 APTIC NO. 42951

Granville, R. A. and W. G. Jaffrey

DUST AND GRIT IN FLUE GASES. GRAVIMETRIC SAMPLING OF SOLID PARTICLES. *Engineering (London), vol. 187:285-288, 1959. 6 refs.*

To obtain a representative point sample of a flue gas stream in which solid particles are entrained, the gas must be aspirated so that it flows into the sampling nozzle at the same speed and in the same direction as the local velocity in the main gas steam. The practical difficulties of obtaining this representative point sample, or a sufficient number to describe the whole flue gas stream in an adequate manner, arise in three ways: stratification of the solids from point to point across the flue, solids concentration variation with time, and flue gas velocity variation with time and position. A device which was originally devised for rapid sampling in hot corrosive flue gases containing micron and submicron sized fume particles, has been developed and can be used for measuring concentrations of fume, dust, and grit. The apparatus consists of a set of sampling nozzles, a sampling probe, a filter unit, a cooling coil, an extractor pump, a flowrate indicator and integrating meter with thermometer, an NPL pitot-static tube incorporating a thermocouple, an inclined gauge, a millivoltmeter, and a suction gauge. Site selection and assembly, installation, and use of the device are described. Procedures for the calculation of gas density, gas velocity, sampling rate, and dry sample volume are presented.

23398 APTIC NO. 43656

Greendale, Allen E. and Daniel L. Love

RAPID RADIOCHEMICAL PROCEDURE FOR ANTIMONY AND ARSENIC. *Anal. Chem., 35(6):632-635, May 1963. 5 refs.*

A very rapid radiochemical procedure was developed for antimony and arsenic. Stibene and arsine are formed by reduction with the nascent hydrogen generated by dropping acid onto dry granular zinc warmed to 100 C, rapidly swept from the solution, and decomposed to the metal in a heated quartz tube. The metallic mirror formed is dissolved in acid and assayed. The chemical yield is consistently between 70 and 80%. About 10 sec is required for separation of the metal from the other elements of a fission product solution. The factor of greatest importance in attaining the maximum yield was reagent temperature. Decontamination factors are indicated; the ratio of activity added to that collected on the arsenic or antimony recovered is the decontamination factor. The speed and high yield attained with this method compared to older separations using arsine and stibene are thought due to the heating of the zinc and the consequent rapid removal of the hydrides from the solution before they decompose, and to the reduction in volume of acid reacting with the zinc. (Author abstract modified)

23399 APTIC NO. 43214

Greenfelt, Peringe

INTROMISSION MEASUREMENTS OF GASEOUS SULPHUR COMPOUNDS IN THE VICINITY OF SULPHATE MILLS. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 2:23 to 2:29. 6 refs. (Sept. 1-6.)*

A flame photometric gas chromatographic method for simultaneous determination of voltile sulfur compounds down to concentrations of less than 10 ppb developed in the U. S. was copied by the Swedish Water and Air Pollution Research Laboratory and used for intromission measurements of hydrogen sulfide, sulfur dioxide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide in the vicinity of three Swedish sulfate mills. In the flame photometer detector, the gases from the column are burned in a hydrogen oxygen flame with a large hydrogen excess. This reducing combustion induces formation in the flame of sulfur gas which, through chemiluminescent reaction, emits light in the 300 to 423 mm waveband. By placing a filter between flame and phototube, which will only transmit light of wavelength approximately 394 nm, a selectivity of from 10 to 30,000:1 is obtained for sulfur compounds opposed to others. The signal from the phototube is proportional to the S concentration not directly but exponentially to the latter s power of 1.9. The calibration unit is described. The sampling probe was set up on the roof of a van about 2.5 m above ground level. The generator unit was always sited 5 to 10 m downwind from the van. No measurements were made further than 5 km from the source factory. The content of the various sulfur compounds varied widely in relation to each other from one analysis to the next. Preliminary findings point to good correlation between smell and instrument response.

23400 APTIC NO. 42866

Griggs, M., C. B. Ludwig, and M. L. Streiff

REMOTE SENSING OF AIR POLLUTION IN URBAN ATMOSPHERES. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 500-503. 3 refs. (Dec. 6-11.)*

Two methods to measure pollutants at low concentrations in urban atmospheres by remote sensing techniques are described. Descriptions of the principal components of each system are given. The long-path absorption measurement method uses a black body source, whose radiation is projected horizontally through the atmosphere with a telescope. The radiation is collected with an identical telescope at ranges up to 3 km and analyzed with a monochromator. The mean concentration of pollutants in the absorption path is determined by analyzing the spectra. The passive emission method does not require a source and may be used both day and night. A high-resolution infrared spectrometer measures the emission spectra of polluted atmospheres. The pollutants are detected by the presence of their emission lines at characteristic wavelengths. Emission measurements are used to determine the ratio of pollutant concentrations. The long path absorption method is more complex than the passive method but is the best way to obtain accurate mean concentrations of pollutants in urban atmospheres.

23401 APTIC NO. 43557

Grindell, D. H.

AN ELECTROSTATIC DUST MONITOR. *Proc. Inst. Elec. Engrs. (London), vol. 107A:353-365, Jan. 1960. 12 refs. (Presented at the Institution of Electrical Engineers, Supply Section, England, March 16, 1970, Paper 3184S.)*

A smoke or dust particle carried by an air stream and subjected to high voltage corona acquires a charge approximately proportional to its external surface area. If such ionized particles are precipitated at a collector electrode, the resultant flow of charge constitutes a current proportional to the rate of deposition of total dust surface, and a significant measure of the toxicity of a chimney discharge is obtained. The theory of a dust monitor incorporating this principle is outlined, and some experiments in smoke measurement are described. Operation of prototype equipment in a pulverized fuel-fired boiler installation is examined. Corrosion and fouling of the sampling tubes and electrodes can be overcome by the choice of suitable construction materials and by air purging at regular intervals. (Author summary modified)

23402 APTIC NO. 43294

Gross, D., J. J. Loftus, and A. F. Robertson

METHOD FOR MEASURING SMOKE FROM BURNING MATERIALS. *Am. Soc. Testing Mater., Spec. Tech. Publ., no. 422:166-204, June-July 1966. 12 refs.*

Based on a study of possible smoke-measuring methods, a laboratory test has been developed for the photometric measurement of smoke form burning materials. The method assumed the applicability of Bauguer's law to the attenuation of light by smoke, and smoke quantity is therefore reported in terms of optical density rather than light absorptance or transmittance. Optical density is the single measurement mist characteristic of a quantity of smoke with regard to visual obscuration. Experiments have been performed on a variety of building finish materials under both flaming and nonflaming (smoldering) conditions, and the results are reported in terms of maximum smoke accumulation; maximum rate of smoke accumulation; and the time period to reach an arbitrary critical smoke level. (Author abstract)

23403 APTIC NO. 43657

Guruswamy, S. and V. S. Narasimhachar

GEOMETRIC MEAN PARTICLE SIZE AND ITS APPLICATION IN THE SAMPLING OF AIR-BORNE DUST. *J. Sci. Ind. Res., Sect. B, vol. 18B:319-323, Aug. 1959. 3 refs.*

To compare sets of experimental data on particle size distributions in airborne dust, it is necessary to choose suitable parameters of particle sizes. The geometric mean size is shown to be a suitable parameter for use in dust sampling work. The method of calculating geometric mean size from experimental data is given, and the usefulness of the geometric mean particle size in dust sampling work is illustrated. Results are included from a sampling of airborne dust by a thermal precipitator at three different places in a mine gallery on a nonworking day. (Author abstract modified)

23404 APTIC NO. 42986

Gussman, Robert A., Anthony M. Sacco, and Roger E. Ladd

DESIGN AND CALIBRATION OF A HIGH VOLUME CASCADE IMPACTOR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 34p., 1972. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-27.)*

An air sampler capable of classifying large quantities of airborne particulate matter into discrete size fractions was developed. Such a fractionation will permit discrete size-related chemical analysis of various particulate pollutants and a more realistic assessment of their health effects. A 30 cu ft/min, five-stage cascade impactor of the slit-type was constructed and calibrated. The calibration aerosol consisted of six different sizes 1.35-14 micron of isodispersed methylene blue produced with a spinning disk generator. The calibration was challenged with heterodispersed aerosols of methylene blue, Arizona road dust, and dioctyl phthalate. Test and calibration results are tabulated. (Author abstract modified)

23405 APTIC NO. 42959

Hager, Robert N., Jr.

APPLICATION OF DERIVATIVE SPECTROMETRY TO THE ANALYSIS OF TRACE GASES. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 5p., 1971. 2 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1045.)*

A derivative spectrometer is sensitive to changes in spectral intensity over a narrow wavelength internal. Specifically, a second derivative spectrometer senses the curvature of the incident spectral intensity, providing an output voltage signal proportional to the second derivative of intensity with respect to wavelength. When such an instrument is combined with a multi-pass White cell, a unique trace gas analyzer results. The analyzer, operating within the middle ultraviolet spectral region, provides a highly amplified derivative spectrum of any molecular narrow band absorption which is used for trace gas identification. The intensity of any peak within a spectrum is proportional to the trace gas concentration. Such an analyzer, utilizing a 20-meter pathlength White cell, is presently being used to automatically monitor ambient air for sulfur dioxide, nitric oxide, nitrogen dioxide, and ozone with minimum detectable concentration limits in the part per billion range. (Author abstract)

23406 APTIC NO. 43634

Hamlin, Philip Aubry

COLORIMETRIC DETERMINATION OF CARBON MONOXIDE, DISSOLVED OXYGEN, AND SULFUR DIOXIDE. *Kansas State Univ., Manhattan, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1971, 78p. 35 refs.*

Phenothiazine dyes, photoreduced to the leuco form in aqueous solutions of aminopolycarboxylate anions as an oxidizing substrate, are described as colorimetric reagents for the determination of dissolved oxygen. A new colorimetric reagent for carbon monoxide is described. The supposed reaction sequence involves CO attack on a palladium complex, which then reduces the iron(III)EDTA complex to the Fe(II)EDTA complex. The Fe(II)EDTA complex is subsequently converted to a more stable complex which is measured spectrophotometrically. The general class of compounds, 5-mercapto 3-aryl-1,3,4-thiadiazone-2-thione, alkali salts (I), were sensitive to sulfur dioxide. The englomerate salts (II), formed by reaction of I with benzyltriphenylphosphonium chloride, were specific for SO2. Application of compounds I and II as a colorimetric reagent for SO2 is limited because of the reversibility of the SO2 adduct which is formed with I and II. (Author abstract modified)

23407 APTIC NO. 43371

Hanna, Thomas R. and Michael J. Pilat

SIZE DISTRIBUTION OF PARTICULATES EMITTED FROM A HORIZONTAL SPIKE SODERBERG ALUMINUM REDUCTION CELL. *J. Air Pollution Control Assoc., 22(7):533-536, July 1972. 4 refs. (Presented at the Pacific Northwest International Section-Air Pollution Control Association, Annual Meeting, Nov. 1970, Paper 70-AP-12.)*

Aerosol size distributions were measured in the air exhausted from a horizontal spike Soderberg aluminum reduction cell at the Kaiser Aluminum and Chemical Corporation plant in Tacoma, Washington. The particle size distributions were measured with the University of Washington cascade impactor. Particle mass concentrations and size distributions were found to vary significantly with changes in the cell process operations. For a typical aerosol size distribution at the exit of the cell hood the mass mean particle diameter was 5.5 micron and the particle size standard geometric deviation was 25. (Author abstract modified)

23408 APTIC NO. 42812

Hanst, Philip L.

AIR POLLUTION MEASUREMENT BY LONG PATH ABSORPTION SPECTROSCOPY. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 492-499. 19 refs. (Dec. 6-11, Paper CP 31 B.)*

Atmospheric spectroscopy involves studies at all accessible wavelengths, with the most useful spectral region being the infrared between wavelengths of 3 and 23 micron. The spectrum of the polluted atmosphere is much less well known than the spectrum of the clean atmosphere. A long optical path is required to bring the absorption bands of ambient atmospheric pollutants up to detectable levels. These long paths can be achieved by creating a single long traversal of the medium by placing the light source a long distance from the receiver, by a two way path in which the light travels to a reflector and back, by using triple path and four way path absorption cells, or by several types of multiple-pass cells which can give hundreds of passes. Measurement methods of air pollutant concentrations by the attenuation of infrared laser lines are discussed. Detection instrumentation for spectral information such as radiometers, scanning spectrometers, interferometers, and dispersive and non-dispersive optical correlation instruments, are reviewed.

23409 APTIC NO. 42428

Hartmann, C. H.

IMPROVED CHROMATOGRAPHIC TECHNIQUES FOR SULFUR POLLUTANTS. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 6p., 1971. 5 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971. Paper 71-1046.)*

Several improvements in instrumental techniques for the analysis of low ppb concentrations of sulfur gases using gas chromatography are described. This work has focused on the analytical problem of ambient air monitoring of the two main sulfur gas pollutants, hydrogen sulfide and sulfur dioxide. The most significant technical improvement is the newly developed silica gel column for ppb concentrations of the light sulfur gases (carbonyl sulfide, hydrogensulfide, carbon disulfide, sulfur dioxide, and methyl mercaptan). A simplified inlet system will be described which improves reliability of the GC system. The flame photometric detector is used as the means of selectively and sensitively detecting the low concentrations of sulfur gases. Improvements are described which have yielded better performance than previously reported for this application of the detector. Also included is a report of field monitoring using this improved GC system. Reliability and repeatability of performance at the low ppb concentrations of sulfur gases is demonstrated.

23410 APTIC NO. 43377

Hemeon, Wesley C. L. and Arthur W. Black

STACK DUST SAMPLING: IN-STACK FILTER OR E.P.A. TRAIN. *J. Air Pollution Control Assoc., 22(7):516-518, July 1972. 1 ref.*

The original Environmental Protection Agency Train for the measurement of particulate concentrations in flue gas comprised two segments: the front half and the impinger train downstream from the filter proper. Opposition to the method and apparatus included objections to its cumbersome and fragile physical features; and also the distorted definition of particulate matter imposed by the inclusion in the particulate sample weight of all material collected in the water filled impingers, which becomes weighable after evaporation at 212 F. Pseudo-particulate matter may be formed by cooling and condensation of the sample stream in the chilled impinger water following the filter proper. The extent of the error due to pseudo-particulate matter is shown with reference to organic condensibles and sulfur dioxide. Sources of condensate and the prevention of condensation are considered. The elimination of impingers in the sampling train is insufficient to overcome sampling problems in gas streams containing appreciable quantities of SO2. The same SO2 oxidation phenomenon was observed with glass fiber filters.

23411 APTIC NO. 42337

Himi, Yasuji

ANALYTICAL METHOD OF METALS IN STACK GAS. *(Haigasuchu no kinzoku seibun no bunseki to sono jitsumu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 8(6):543-549, June 1972. 5 refs.*

Methods for analyzing metals in flue gases are described, with emphasis on sampling techniques. The metal particles in stack gases have inertia, so that the movements are expected to be different from that of the gases. Therefore, proper sampling which can show the exact concentrations of all components in the stack gas, is difficult. This usually depends on sampling location and the gas suction velocity. Generally, the long, vertical part of a stack is the ideal location, and the sample must be collected from several points with a constant gas suction velocity. This is done by dividing the cross section area of the sampling location into at least four parts, with each having a maximum area of one sq m, and samples from the center of each part are taken. Results from five different sampling methods on the same stack are shown.

23412 APTIC NO. 42434

Hinkley, E. D. and R. H. Kingston

REMOTE HETERODYNE DETECTION OF GASEOUS POLLUTANTS WITH TUNABLE LASERS. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 1p., 1971. 2 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1079.)*

At elevated temperatures, all gases emit characteristic infrared radiation into the environment. By the use of lasers as tunable local oscillators in the infrared heterodyne configuration, remote, passive detection of this emitted radiation can be performed. It appears, for example, that gas concentrations of as low as 10 ppm can be detected in smokestack effluent from a distance of 1 km. The theoretical basis for this type of heterodyne detection is described, and some preliminary experimental results shown. (Author abstract)

23413 APTIC NO. 43554

Hodgeson, J. A.

REVIEW OF ANALYTICAL METHODS FOR ATMOSPHERIC OXIDANTS MEASUREMENTS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Div. of Chemistry and Physics, 37p., 1972 (?). 52 refs.*

Instrumental and manual methods currently available for the measurement of atmospheric oxidants are reviewed. Techniques used in the United States are emphasized and their advantages and disadvantages are discussed. Commercial systems are evaluated in terms of general operating principles rather than of specific instruments. The ability of these techniques to meet the measurement requirements defined by Federal air quality oxidant criteria is discussed. Alternate chemical techniques that may have some advantages over the neutral, buffered potassium iodide procedure are considered. Some attractive, alternative instrumental procedures which are ozone-specific are presented; these systems are based on chemiluminescence and ultraviolet absorption photometry. Electrochemical and colorimetric methods for total oxidant measurements are compared. Some data are presented on relationships of ozone and total oxidants. (Author abstract modified)

23414 APTIC NO. 43659

Houston, Reagan

PSYCHOLOGY OF INDUSTRIAL ODOR PROBLEMS. *Preprint, American Inst. of Chemical Engineers, New York, 11p., 1972. (Presented at the American Institute of Chemical Engineers, North Central Regional Meeting, Cleveland, Ohio, April 28, 1972.*

Some of the problems encountered when dealing with odor detection are discussed. A group or odor panel of 15 to 30 persons is generally needed to provide a statistically accurate threshold. For a given concentration of odor, a certain percentage of the panel will affirm the odor. The preferred threshold is the concentration at which 50% of the panel affirms the odor. This avoids the effect of extremely sensitive or insensitive people. An objectionable odor is more subjective than just any odor. Some odors (like musk) are desirable when weak and objectionable when strong. Hydrogen sulfide is objectionable when weak, but acceptable when strong. In the common situation, as with sulfur dioxide, identification and objection occur at the same concentration. Memory patterns are influenced by racial history, occupation, sex, age, and life style. The standard method for establishing an odor panel is described. The use of gas chromatography in odor detection is discussed. Other instrumental approaches are limited to a few well known chemicals, such as H2S and SO2. Several control methods are briefly discussed along with public relations problems.

23415 APTIC NO. 43282

Hughes, J. G. and A. T. Jones

THE ESTIMATION OF PHOSPHINE IN AIR. *Am. Ind. Hyg. Assoc. J., 24(2):164-167, March-April 1963. 4 refs.*

A simple field method was developed for estimating phosphine in the atmosphere of grain silos and other fumigation areas. The procedure uses silver nitrate-impregnated papers as a means of visual detection. Quantitative estimation as low as 0.05 ppm is by color comparison with standard stains. Confirmatory analysis is by determination of reduced silver as the sulfide. The procedure, laboratory trials, and preparation of visual standards are described. (Author abstract modified)

23416 APTIC NO. 42318

Iammartino, Nicholas R.

FINE PARTICLES START COMING UNDER SCRUTINY. *Chem. Eng., vol. 15: 32-34, July 10, 1972. 3 refs.*

Pollution and occupational health standards aimed specifically at particles under 2 micron are in the offing. Attention has been shifting radidly to fine particles for several reasons: mounting medical evidence continues to show that particles under 2 micron are the ones most damaging to human health; pollution experts agree that these cause reduced air visibility; and some scientists fear that increased atmospheric loading of fine particles could have far-reaching effects on the earth's climate. The few industries that now must monitor stack gases for fine particles generally use an Environmental Protection Agency type sampling train. The EPA train draws stack gas through a heated probe isokinetically, and deposits entrained particles on a membrane or on a filter of matted glass fibers or paper. The filter is generally weighed before and after use. A possible alternative to the EPA train is the Particle Mass Monitor, introduced last year by Thermo-Systems Inc., St. Paul, Minn. The instrument deposits gas entrained particles on a piezoelectric quartz crystal via electrostatic precipitation. Since the crystal's resonant oscillation frequency decreases linearly with deposited mass, the time rate-of-change of frequency indicates particle concentration. Real-time and automatic operation are features of the beta attenuation method for determining mass of particles emitted in stack gases. Inertial impaction is the usual technique for analyses of size distribution. Cyclones and single particle counters are also described. The only technique that is used to any extent for particles 0.01 micron and below is thermal precipitation, followed by examination of the captured particles with an electron microscope.

23417 APTIC NO. 42787

Igarashi, Katumi

POLLUTION MEASUREMENT TRIALS USING X-RAY REFRACTION METHOD. *(X-sen kaisetsu shuho ni yoru kogai shokutei no kokoromi). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 39(6):585- 588, June 1972.*

The characteristics of X-ray analysis are simplicity, easy sample preparation, good reproducibility, and wide range of quantitative determination. For accurate analysis, the sample particle must be finely ground and the distribution of particle size must be random. X-ray diagrams of quartz powder show that particles smaller than 5 micron have a diffraction 35% stronger than particles of 15 to 50 micron, and the formation has a standard deviation of 1%, while that of the latter is 20%. Sharp and low background patterns are usually difficult to obtain from mineral samples, such as soots in air. Therefore, simultaneous determinations of samples from various sources or locations are conducted.

23418 APTIC NO. 43473

Izmailov, G. A.

MEASURING THE GRAVIMETRIC CONCENTRATION OF DUST IN THE AIR USING BETA - RADIATION. *Ind. Lab., 27(1):40-43, Aug. 1961. 3 refs.*

Measuring the gravimetric concentration of dust is one of the most difficult meteorological problems. The most accurate results are given by the gravimetric method, which can be used as a standard. In this method, a known volume of dust containing air is passed through a dust trap, the weight of trapped dust is found, and the weight of the dust divided by the volume of air; this gives the gravimetric concentration of the dust in the air (in mg/cu m, STP). To determine the mass of one square centimeter of a continuously collecting filter, the method of Beta-radiation absorption was used. This method permits the continuous measurement of the mass of dust trapped by the filter. At a constant flow rate of the air passing through the filter, the weight of dust held by the filter is directly proportional to the dust content of the air. In the device developed for measurement, the Beta-radiation passing through the filter is recorded by a scintillation counter. The derivative of the output voltage of the counter with respect to time of volume of air passing through the filter will characterize the rate of increase in the weight of dust on the filter and serve as a measure of the dust content of the air. The error in measuring the dust content did not exceed + or 12% in the prototype of the instrument tested.

23419 APTIC NO. 42693

Jackson, D. W.

NEW DEVELOPMENT OF A CW LASER RADAR. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 4p., 1971. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1081.*

A continuous wave laser radar (lidar) technique has been developed for the remote measurement of smoke plume opacity. Calculations indicate that it will be possible to modulate a low power continuous laser beam, detect scattered laser light and measure, in real time, the scattering as a function of range, thus deducing plume opacity. Thus, the same characteristics of smoke plumes may be measured as have been done previously with pulsed systems. This technique offers the major advantage over conventional high peak power pulse laser techniques of being completely eye safe. Additional advantages are low cost, simple operation and simple direct readout. (Author abstract)

23420 APTIC NO. 42418

Johnson, M. C.

RAMAN REMOTE GAS SENSOR. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 490-491. 6 refs. (Dec. 6-11, 1970, Paper CP 31A.)*

The performance of solar-blind and nonsolar-blind laser Raman remote sensing systems was compared. Distance to the plume was 300 m and telescope diameter was 20 cm. Optical and quantum efficiencies were 0.007 overall. Sulfur dioxide and nitric oxide concentrations were 1000 ppm. When the ratio of SO2/nitrogen backscatter was measured in place of total intensity, the solar blind system provided a better signal-to-noise ratio for daytime operation. The SO2 Raman cross section in the absorption band is being investigated.

23421 APTIC NO. 43605

Karasek, Francis W., Wallace D. Kilpatrick, and Martin J. Cohen

QUALITATIVE STUDIES OF TRACE CONSTITUENTS BY PLASMA CHROMATOGRAPHY. *Anal. Chem., 43(11):1441-1447, Sept. 1971. 14 refs. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Cleveland, Ohio, March 1971.)*

By using an ion-molecule reactor and ion-draft spectrometer, the plasma chromatograph produces a plasmagram pattern characteristic of a trace constitudent in a gas. Concentrations of 1 ppb and less are detected. Qualitative aspects of the positive and negative plasmagrams obtained for the organic compounds of benzoic acid, salicylaldehyde, phenethyl alcohol, acetophenone, and napthalene are presented. An interpretation is made of the plasmagrams in terms of the type of ion-molecule complexes formed, concentration effects, and a measure of their molecular weight. 0When hydrated positive hydrogen and hydrated negative oxygen reactant ions are used, plasmagrams characteristic of the sample molecules, their concentrations, and reactivity with the reactant ion are obtained. A study of the selectivity and sensitivity possible when different reactant ions are used for analysis of specific trace compounds promises to broaden the scope of the method considerably. (Author abstract modified)

23422 APTIC NO. 42403

Katou, Tatsuo

GAS CHROMATOGRAPHIC ANALYSIS OF ODOR POLLUTION IN ATMOSPHERE. *(Gasu kuromatogurafu-ho ni yoru akushu no kankyo bunseki). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 10(2):97- 104, April 1972. 5 refs.*

An analytical method for measuring odorous pollutants in the atmosphere, using the concentration process and gas chromatographic analysis, was developed. A high concentration apparatus for the GC sample was designed, based on the surface adsorption effect of fire brick cooled with liquid oxygen. An air sample of 100 l can be concentrated to a few milliliters with 100% efficiency in less than 10 min. Components with boiling points within 100 to + 200 C were analyzed quantitatively; the analytical limit for detection with the flame ionization detector was 10 to the 12th (ppt). The practical application of the method for field studies of odors emitted by kraft pulp mills, petrochemical combines, and fish meal plants is considered.

23423 APTIC NO. 43672

Katz, Morris

THE STANDARDIZATION OF METHODS OF SAMPLING AND ANALYSIS. *Intern. Clean Air Conf. Proc., England, 1959, p. 147-152. 26 refs.*

For purposes of sampling and measurement, air pollution can be classified as particulate matter, gaseous or vapor products, and radioactive compounds. Various sampling and analytical procedures in use and the criteria for the procedures are discussed. Items suggested for international standardization include the definition of terms and units, dustfall, smoke and suspended particulate impurities, sulfur dioxide, nitrogen oxides, ozone or oxidants, hydrocarbons, carbon dioxide and carbon monoxide, aldehydes, and fluorides. Measurement methods for dustfall, suspended impurities, sulfur dioxide, and fluoride are reviewed. The planning of air pollution surveys, selection of sampling sites, choice of instruments and sampling methods, analytical procedures, and the treatment and correlation of data should receive coordinated attention and clarification.

23424 APTIC NO. 43248

Knollenberg, R. G.

PARTICLE SIZE MEASUREMENTS FROM AIRCRAFT USING ELECTRO-OPTICAL TECHNIQUES. *Proc. Electro-Optical Systems Design Conf., Anaheim, Calif., 1971, p. 218-233. 4 refs. (May 18-20.)*

Particle size spectrometers covering sizes from submicron aerosols to the largest precipitation elements are described. They include the aerosol size spectrometer, the extinction cloud droplet size spectrometer and optical array particle size spectrometers. The extinction technique is markedly superior to scattering systems currently in widespread use to size aerosols. It is also a technique with sufficient resolution to study small cloud droplets. For larger cloud droplets and precipitation elements, the optical array has decided advantages over any other technique. If an aircraft could fly at 10 knots, the optical array spectrometer would be satisfactory down to particles of 1-micron size. It is the short transit time and wide bandwidth required that precludes 1-micron resolution with the optical array spectrometer at normal aircraft speeds. With the Venus entry vehicle, the anticipated free fall velocity of 10 m/sec makes 1-micron resolution possible. If a particular requirement does not involve particle transit times less than 10 ns, the optical array spectrometer is the best available technique for particles of optically resolvable size.

23425 APTIC NO. 43624

Kolbow, Peter and Roland Thieme

SMOKE-DENSITY METER FOR SUPERVISING THE PERCENTAGE OF DUST CONTAINED IN THE FLUE GASES OF INDUSTRIAL PLANTS. *Siemens Rev., 38(8):276-279, Aug. 1965. 2 refs.*

A simple and reliable method for keeping a dust concentration under continuous observation is the Light-Absorption Method. The essential parts of a setup based on this method are a light-sensitive receiver and a light-beam transmitter which are so arranged that a beam of light projected from the transmitter to the receiver will pass through a representative portion of the test gas. Suspended particles in the gap between the transmitter and the receiver will cause the beam of light to be dimmed. One method for graduating the scale of this type of smoke-density meter is an exponential scale division, dependent on the width of the test gap. On such a scale, the small dust-concentration values are spread far apart, while the higher values are crowded closer together. For this reason, it has not been possible, as yet, to design a standard type of scale graduation equally adapted to all conditions. To obtain a uniform scale graduation, it was necessary to eliminate the dependence of the indication on the width of the test gap. A smoke-density meter was designed so that test readings are evaluated by multiplying the indicated dust concentration by the extinction coefficient found for the kind of dust being studied, and thus determine the actual quantity of the dust emitted. The meter consists of a source of light serving as a transmitter, a receiver with an incorporated silicon photocell, one mounting tube each for the transmitter and the receiver, and a measuring attachment with an indicating or recording instrument. This meter enables direct dust-density measurement to be conducted in a simple and reliable manner in flue-gas ducts; changes in the dust emission are immediately indicated. Since the scale reading is proportional to the dust concentration, the scale of the recorder used can be calibrated on site in g/cu m.

23426 APTIC NO. 42834

Kottke, Michael L., Robert G. Greenler, and Harland G. Tomkins

AN INFRARED SPECTROSCOPIC STUDY OF CARBON MONOXIDE ADSORBED ON POLYCRYSTALLINE GOLD USING THE REFLECTION-ABSORPTION TECHNIQUE. *Surface Sci., 32(1):231-243, July 1972. 13 refs.*

The carbon-oxygen stretching band is recorded for carbon monoxide adsorbed on an evaporated gold film. This band appears at 2120/cm for low coverage and shifts to 2115/cm for maximum coverage. The reflection-absorption system produces a measurable band from as little as 1/20 of monolayer coverage of carbon monoxide, using a standard spectrometer with no additional signal processing. From the band intensities adsorption isobars and isoteres are plotted. From the isoteres, heats of adsorption and entropy changes on adsorption are obtained for coverages of 0.1-0.6 monolayer. The isoteric heat of adsorption for coverages from 0.1-0.6 averages 13.1 kcal/mole. The difference between the gas-phase entropy at 1 atm and the differential molar entropy of the adsorbed layer averages 26.3 cal/mole C. (Author abstract)

23427 APTIC NO. 42432

Krause, F. R., H. T. Betz and D. H. Lysobey

POLLUTION DETECTION BY DIGITAL CORRELATION OF MULTISPECTRAL, STEREO-IMAGE PAIRS. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 14p., 1971. 26 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971. Paper 71-1106.)*

Remote detection of air pollution circulation patterns is proposed to eventually predict the accumulation of hazardous surface concentrations in time for preventive emission control operations. Earth observations from space platforms will contain information on the height, mean velocity and lateral mixing scales of inversion layers and pollution plumes. Although this information is often not visible on photographs, it could conceivably be retrived through a digital cross-correlation of multispectral stereo image pairs. Laboratory and field test results are used to illustrate the detection of non-visual inversion layers, the reduction of dominant signal interference, and the spectroscopic identification of combution products. (Author abstract)

23428 APTIC NO. 43247

Krupnov, A. F., L. I. Gershtein, V. G. Shustrov, and V. V. Polyakov

SUBMILLIMETER MICROWAVE SPECTROSCOPY OF FORMALDEHYDE. *Opt. Sprectry (USSR) (English translation from Russian of: Opt. i Spektrokopiya), 28(3):257-260, March 1970. 16 refs.*

Microwave spectroscopic methods were used to study the rotational spectrum of the formaldehyde molecule in the 350-580 GHz range. The frequencies of 29 lines belonging to transitions of the R branch with different K values were measured. The centrifugal constants collected on the basis of experimental data made it possible to calculate the spectrum of formaldehyde in the submillimeter range giving an agreement with the experimental spectrum with a relative mean square error of 3 times 10 to the negative 6th power, and also to further refine the rotational constants. The apparatus and experimental technique are described.

23429 APTIC NO. 42806

Kudo, Akira, Kanji Takahashi, and Takeshi Kozima

NUMERICAL CALCULATIONS FOR ELECTRICAL CHARGE ON AEROSOL PARTICLES. II. ESTIMATION METHOD OF PARTICLE SIZE DISTRIBUTION. *Kyoto Daigak Kogaku Kenkyusho Iho (Bull. Eng. Res. Inst., Kyoto Univ.), no. 151: 1-41, Jan. 1971. 8 refs.*

A fundamental calculation was conducted to develop an estimation method for aerosol particle size distribution. Assuming the Boltzmann charge distribution law, two relationships between electrical mobilities and number fractions of multicharged particles and between the mobilities and charge fractions of the multi-charged particles were obtained. Therefore, when a log- normal particle size distribution can be assumed, it becomes possible to determine the particle size distribution of the unknown aerosols by using a combination of electrical mobility analyzer and a particle number concentration counter, or a combination of the analyzer and a micro-electrometer. The applicable geometric mean particle radius of unknown aerosols ranges within 0.010-1.00 micron with the logarithm of geometric standard deviations within 0.100-0.70. (Author abstract modified)

23430 APTIC NO. 43201

Lambert, Jack L. and Philip A. Hamlin

A NEW COLORIMETRIC REAGENT FOR CARBON MONOXIDE. *Anal. Letters, 4(11):745-750, Nov. 1971. 9 refs.*

A new colorimetric reagent for carbon monoxide is described. The reaction sequence involves reduction by CO of a lead chloride ion, which then reduces ferric ethylenediaminetetraacetic acid to a ferrous EDTA ion. The latter undergoes ligand exchange with 2,2 prime -dipyridyl or 1,10-phenanthroline to form the more stable colored iron compound (FeL32+, where L is 2,2 prime -dipyridyl or 1,10-phenanthroline), which is measured spectrophotometrically. Sodium molybdate enhances the overall reaction. The color intensity produced is nonlinear but reproducible. The method is unique in that a soluble colored compound is produced rather than a metal solution. (Author abstract modified)

23431 APTIC NO. 42985

Langan, Lee

GASEOUS POLLUTION MEASUREMENTS ALONG PATHS OF LIGHT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1972. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-28.)*

Instrumentation for ambient air measurements by remote-sensing techniques in open air is described. A correlation spectrometer has been utilized for 4 yrs at various sites and under various meteorological conditions to measure the presence of sulfur dioxide and nitrogen dioxide in an open path between an artificial light source and the instrument. Test results are used to show the progress of these experiments and the problems encountered. Most recent measurements have resulted in sensitivities on the order of one part per billion for each gas. These results would indicate that more intensive investigation of the potential of long-path measurements is warranted. It is also apparent from these measurements that the user must utilize spatially integrated results in a manner consistent with his goals. Shorter lines will be most representative of the ground-level flow of gas from an industrial site, while longer lines can monitor the ambient air over an entire town. (Author abstract modified)

23432 APTIC NO. 42433

Lapp, M., L. M. Goldman, and C. M. Penney

FUNDAMENTAL DATA FOR RAMAN SCATTERING MEASUREMENTS OF SPECIES CONCENTRATIONS AND TEMPERATURE. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 6p., 1971. 5 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1084.)*

Raman scattering is a method for the sensing of environmental pollutants which measures both constituency and temperature of emission, either remotely or in a test cell. In order to employ successfully laser Raman scattering for pollution diagnostic purposes, several types of fundamental data are still required. The measurement of the vibrational Raman scattering cross section of nitric oxide and carbon monoxide relative to that for nitrogen at several wavelengths; the measurement and analysis of fluorescence from nitrogen dioxide over a variety of experimental conditions, and observation and analysis of the structure of vibrational Raman lines are discussed.

23433 APTIC NO. 42429

Lilienfeld, Pedro

BETA ABSORPTION MASS MONITORING OF PARTICULATES - A REVIEW. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C., 31p., 1971. 25 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1031.)*

The theory and application of beta-radiation absorption for the measurement and monitoring of airborne particulates are discussed. The use of this technique, both for source testing and for ambient air quality monitoring is reviewed. Various particle collection methods used in conjunction with beta absorption sensing configurations are considered. State of the art and current developments of instrumentation approaches for the automated measurement of mass concentration and size distribution of aerosols by beta absorption are discussed. Methods for electronic signal processing and recording are presented.

23434 APTIC NO. 43262

Lilienfeld, Pedro and John Dulchinos

PORTABLE COAL MINE DUST INSTANTANEOUS MASS MONITOR. *Preprint, American Industrial Hygiene Assoc., Detroit, Mich., 25p., 1971. 22 refs. (Presented at the American Industrial Hygiene Assoc. Conference, Toronto, Ontario, May 27, 1971, Paper 82.)*

A battery-operated, portable coal-mine dust mass monitor has been developed. Its operation is based on the measurement of beta-radiation adsorption by aerosol particles collected by inertial impaction on a thin polyester film substrate. The nonrespirable fraction of the dust is retained by a cyclone precollector and the respirable particles, down to almost 0.4 microns in diameter (unit density), are collected by the impactor-mass sensing stage. Each measurement-sampling run is performed in 1 min, at the end of which the mass concentration during that period is displayed automatically on a digital semiconductor readout. The displayed output is proportional to the ratio of the logarithms of the initial to the final beta-pulse rate, resulting in a measurement that is independent of beta-source decay, variation of substrate thickness and barometric pressure, and changes in detector sensitivity. The mass concentration range of the instrument is 1 to 50 mg/cu m, at a sampling flowrate of 2 l/min. Timing and signal processing are performed by means of solid state analog-digital circuitry. The instrument is designed to meet the U. S. Bureau of Mines intrinsic safety requirements for operation in coal mine environments.

23435 APTIC NO. 43561

Mark, H. and M. J. D. Low

BACKGROUND ELIMINATION IN SPECTRA GENERATED BY FOURIER TRANSFORM SPECTROMETERS. *Preprint, New York Univ., N. Y., Dept of Chemistry, 18p., 1970 (?). 10 refs.*

Two methods are described for reducing or eliminating the background of single beam spectra obtained by Fourier transform spectrometers incorporating analog data reduction systems. One method involves increasing the amplifier gain so that the central spike of the interferogram is clipped, while the second method involves the use of an electronic device which eliminates the central part of the interferogram. Both methods lead to spectra having flat backgrounds, but distortion of the spectrum may be caused. (Author abstract modified)

23436 APTIC NO. 43629

Marsh, R. C.

A COMPARISON OF DUST COUNT DATA OBTAINED FROM DIFFERENT MEASURING METHODS. *Am. Soc. Testing Mater. Spec. Tech. Publ., no 342:24-28, 1967. 6 refs.*

Dusts counts were taken over several months in four different areas which exhibited different average dust loadings. The data from two light-scattering methods (a forward-angle light-scattering photometer and a particle counter using the light scattered from individual particles) were quite consistent and allowed an easy comparison of the four areas sampled. However, the data obtained from two microscopic methods (a settling technique and a membrane filtration technique) did not permit comparison of the areas because the counts from different areas overlapped. A calibration of the photometer system in particles per cubic foot was achieved by using an experimental particle size distribution curve. This study indicates that different experimental clean rooms monitored by different personnel can be compared when data taken the two light-scattering systems are used but not with the two microscopic methods.

23437 APTIC NO. 42803

Matsui, Toru, Shingo Mihara, and Sadao Egami

AIR POLLUTION MONITORING SYSTEM. *(Taiki osen kanshi shisutemu). Text in Japanese. Hitachi Rev. (English translation from Japanese of: Hitachi Hyoron), 54(6):71-74, June 1972. 2 refs.*

To solve the problem of environmental pollution, it is necessary to grasp the present status of pollution and then formulate a concrete policy for dealing with each type of pollution. However, this phenomenon of air and water pollution and other public nuisances, such as noise, vibration, and offensive odor, is an uncertain system intricately associated with homes, industries and communications; it is also influenced by weather, ocean, and geographical conditions. Consequently, its handling is extremely complicated. For controlling this complex phenomenon there is a system which conducts concentrated monitoring at the central monitoring station based on data received from observatory stations which, located throughout the concerned area, detect and sample the data. An air pollution monitoring system centering around a newly developed measuring data communication system is discussed. (Author summary modified)

23438 APTIC NO. 42378

McLellan, Alden

SATELLITE REMOTE SENSING OF LARGE SCALE LOCAL ATMOSPHERIC POLLUTION. *Internatinal Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 570-575. (Dec. 6-11, Paper CP 38C.)*

No serious attempt has been made to date to use satellite radiance data to determine the change in large scale local conditions of turbidity. However, it should be possible to observe local atmospheric turbidity from an operating satellite, which has optical detectors aboard, even though these detectors were not primarily designed for haze observations. The Applications Technology Satellite III (ATS-III) was used along with a Multicolor Spin Scan Cloud Camera, which consists of a high resolution telescope, three photomultiplier light detectors, and a precision latitude step mechanism. In addition two multiusage programs have been written and debugged for use in the alignment of ATS pictures and in the averaging and sampling process of data reduction of radiance values. The reflected earth radiance values were compared for the Altar Desert, the city of Los Angeles, and the Pacific Ocean off Baja. Data are presented showing the corrected radiance values for the Los Angeles region as well as the ground based hourly data of horizontal visibility and sampling of particulate data. As expected, the highest albedo was found over the desert, followed by the city and the ocean. The ATS data tended to confirm the ground based data that atmospheric turbidity, or at least the component which is optically absorbing, decreased from 0900 to 1400 PCT on April 23, 1968. Visibility, particulate matter, and turbidity values for Los Angeles are given.

23439 APTIC NO. 43219

McMichael, H. E.

FLUE GAS ANALYSIS - SAMPLING, MEASUREMENT, UTILITY. *Instrument Society of America, Pittsburgh, Pa., Proc. Instr. Soc. Am., Natl. Power Instr. Symp., 5th, 1962, p. 91-97. 2 refs.*

Within the past 10 years the concentration of oxygen (O2) in flue gases has been employed as the index most representative of combustion conditions existing in the furnace. Oxygen has gained pre-eminence as the combustion efficiency index not only because of the negligible effect of fuel analysis on its relation to excess air but also because of the technological advancements in the state of the art of collecting and analyzing the sample for the 02 concentration. The problems in flue gas analysis are obtaining a sample of the flue gases that is representative of the gases in the duct, transporting this sample rapidly without dilution or pollution to an analyzer where the gas concentration can be determined, and displaying the results of the analysis on a recorder, indicator, or data system. As a result of studies which led to the conclusion that multiprobe sampling was necessary to obtain a representative sample in large ducts, a sample averaging unit was designed by the Leeds and Northrup Co. to facilitate application of these conclusions. This unit combines into one stream equal rates of flow taken from several different sample streams and permits traversing of the duct in which the probes are located to detect abnormal stratification problems. A new 02 analyzer of the thermomagnetic type employing the principle of paramagnetic convection is a completely self contained unit, with a flow regulating equipment and the 02 indicator as integral parts of the analyzer. Where high sensitivity, accuracy, and speed of response are requirements in analyzing the gas sample for the major combustibles constituents, as infrared analyzer is utilized. Presently, it is difficult to obtain a sample for carbon dioxide analysis that is compatible with the sample for O2 analysis from an availability, maintainability, or speed of response standpoint.

23440 APTIC NO. 42724

McMullen, Thomas B.

AMBIENT AIR QUALITY MONITORING NETWORKS: ESTABLISHMENT, OPERATION, AND DATA EVALUATION. *Air Pollution Control Assoc., Pittsburgh, Pa., 9p., 1971. (Presented at the Air Pollution Control Association, Southern Section, Annual Meeting, 2nd, Chattanooga, Tenn., Sept. 24, 1971.)*

General considerations concerning the establishment and operation of an air monitoring network are described. Placement of samplers must be based upon careful study of stationary and mobile sources of pollution, wind patterns, and anticipated areas of expanded population growth. A suitable time interval for sampling is every sixth day. The overall monitoring network of an area should be designed so that the collection of data will not be interrupted by special studies and emergency episode situations. An example of basic data analysis procedures is provided.

23441 APTIC NO. 42630

Mitsugi, H., T. Koyama, Y. Nakagawa, H. Kosaka, N. Takata, and H. Watanabe

ON THE MEASURING OF SUSPENDED PARTICULATES IN THE ATMOSPHERE. *(Taikichu fuyu biryushi no sokutei hoho ni tsuite). Text in Japanese. Hyogoken Kogai Kenkyujo Kenkyo Hokoku (Rept. Public Nuisance Res. Inst., Hyogo Prefect.), no. 3:1-7, 1972. 7 refs.*

In evaluating the concentration and composition of atmospheric particulate matter, sampling of the atmosphere has been normally conducted using high volume air samplers. However, the real effect of particulate pollutants on human health or vegetation can not be adequately determined by high volume filter data alone. It is important to evaluate aerosol composition, concentration, and particle size distribution. The properties of a high volume air sampler and a respirable dust sampler were investigated. As a result of investigations on three types of high volume air samplers, a high correlation and significant difference between these measurements were found. The high volume air sampler with shelter is effective for measuring suspended particulates less than about 20 micron. The data from several different respirable dust samplers, filter holder with separator (S-H), high volume air sampler with cyclone (HV-CY), and low volume air sampler with cyclone (LV-CY), were compared. These results showed that high correlations exist for all particulate measurements and a suitable sampler can be chosen on the basis of the purpose. The S-H sampler is a suitable respirable dust collector, but it leaves something to be desired for practical use. The samples obtained using HV-CY and LV-CY samplers are amenable to chemical analysis. The HV-CY is suitable for short term measurements, and the LV-CY is suitable for long term measurements. The D-A sampler is the most suitable monitor of particulate air pollution, but the composition of the particulates obtained using this sampler were not analyzed. (Author summary modified)

23442 APTIC NO. 43448

Mitsugi, Hidekatsu, Nobuhiro Takata, Muneyuki Motoyama, Makoto Akamatsu, and Genzo Hashizume

DETERMINATION OF ZINC AND LEAD IN SUSPENDED PARTICULATES BY FLUORESCENT X-RAY SPECTROMETRY. *(Keiko X sen ni yoru fuyujinai chu no aen oyobi en no bunseki). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 19(10):1383-1388, Oct. 1970. 18 refs.*

Nondestructive determination of zinc and lead in suspended particulates was investigated by using the filter paper method and the briquet method. The samples collected on the filter paper by using a high-volume air sampler were determined nondestructively and rapidly by the filter paper method. The samples collected by an electric precipitator were diluted with boric acid and then determined by the briquet method. To prepare the standard samples, zinc oxide, lead dioxide, or lead nitrate were diluted to a given concentration with kaolin which was regarded as a typical constituent of suspended particulates. Ferric oxide and calcium sulfate were added to the standard samples to check the matrix effect. The quantitative ranges were above 1 microgram for Pb by the filter paper method and above 0.5 microgram/g for Zn and 5 microgram/g for Pb by the briquet method, respectively. Analytical results of Zn and Pb in suspended particulates by this procedure agreed with those by the atomic absorption method.

23443 APTIC NO. 42938

Monkman, J. L.

GAS CHAMBER MICROAPPARATUS IN IDENTIFICATION OF AIR-BORNE POLLUTANTS. *Anal. Chem., 27(5):705-708, May 1955. 10 refs.*

In the identification of air pollutants, samples on microslides, glass wool, or other holders are exposed to reagents in the vapor phase. The reactions are carried out in gas chambers of borosilicate glass constructed from the two sections of a standard taper joint. By breaking the chamber at the joint, the sample may be inserted and the joint closed, after which the sample may be exposed to a gaseous reagent or to several in succession. During the vapor treatment, microslide samples may be withdrawn at intervals for microscopic examination and photomicrographing. The composition of the effluent gas may be studied by the use of paper disks sensitized for gases such as arsine, or by infrared investigation of organic material caught on silica gel contained in absorbers downstream from the reaction chamber. The following reagents were investigated: acetic acid, hydrochloric acid, nitric acid, oxygen, nitrogen, hydrogen, water vapor, alcohol, ammonia, and acetylacetone. Results are presented for calcite, iron compounds, arsenic, organic material, and metallic oxides and metals. (Author abstract modified)

23444 APTIC NO. 42962

Mortstedt, S. -E., N. Walde, and K. -E. Egeback

INVESTIGATING A PROPOSAL REGARDING A EUROPEAN PROCEDURE FOR DETERMINING AIR POLLUTANTS PRODUCED BY GASOLINE-FUELED AUTOMOBILES. *(Undersokning rorande forslag till europeiskt forfarande for bestamning av luftfororeningar fran bensinbilar). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-15, 29p., Nov. 8, 1967.*

The feasibility and reproducibility of an exhaust test procedure, proposed by ECE for gasoline engine automobiles, was investigated. Different dynamometer brake adjustments were tested, and certain modifications in the proposed test cycle are suggested. Reproducibility tests, carried out after hot and cold starts, showed that the variations in the exhaust volume and the carbon monoxide and hydrocarbon contents are usually within 5% and 10%, respectively, during the complete test cycle and for hot start. Very little influence of the tire pressure on the exhaust emission was observed. The introduction of an additional weight class, compared to the USA procedure, proved to be unnecessary. The cooling fan, specified by the ECE proposal, had no influence on the emission from the car investigated. The test temperature range of 15-30 C should be reduced since tests performed at temperature near the respective limit values showed great variations in both the exhaust volume and the carbon monoxide and hydrocarbon content. While the brake effect of the laboratory dynamometer had hardly any influence on the test results, it should be adjusted according to the absolute pressure measured in the suction pipe rather than according to vacuum as specified in the ECE proposal. The ECE proposal should be further completed with a specification of the test cycle to be applied for cars with automatic transmission.

23445 APTIC NO. 42967

Mortstedt, S. -E., K. -E. Egeback, R. -M. Egeback, F. Karlsson, and S. A. Klingfeldt

SMOKE MEASUREMENT ON MOVING DIESEL-ENGINE-POWERED VEHICLES. TESTS PERFORMED UNDER FULL LOAD AND CONSTANT ENGINE SPEED CONDITIONS. *(Matning av rok vid prov pa vag med dieselmotordrivna fordon. Prov vid full belastning och konstant motorvarvtal). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-51, 14p., Sept. 3, 1970.*

Smoke measurements were performed on Diesel-engine-powered vehicles (passenger cars, trucks, and buses) under full load and constant engine speed conditions by means of a Bosch EFAW 65A type instrument to determine the necessary drive time before exhaust sampling, the spread of the test data within and between test series under identical or comparable conditions, as well as the accordance between data obtained from highway and laboratory tests. The investigations revealed a necessary drive time of 7 to 13 sec for the hot engine before sampling. Sufficient reliability can be reached by applying three to five filter samplings within each test for determining the average. A comparison of test data for the same vehicle tested under comparable conditions shows good reproducibility of the tests, the mean deviation for three to five samples being zero to 0.2 Bosch unit. While tests performed in rainy weather would give too low values with great spread, air temperature and relative humidity seem to be of no significant influence. A comparison of data obtained from highway and laboratory tests shows no significant differences in the spread of the test data.

23446 APTIC NO. 43134

Mortstedt, S. -E.

COMPARISON OF RESULTS AS OBTAINED FROM ECE-TESTS AND TESTS SPECIFIED IN THE USA FOR 1970 AND 1972 CAR MODELS. *(Jamforelser mellan resultat fran ECE-prov och prov enligt USA-lag for 1970 resp 1972 ars bilmodeller). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-71, 10p., March 4, 1971. 3 refs.*

Results obtained from ECE-tests and tests specified for 1970 and 1972 car models in the USA are compared, and relationships between the different results are derived. The comparison is based on tests performed on 315 cars in the USA and in Sweden. Relationships between ECE and USA70, USA72, and USA70 as well as between USA72 and ECE test values for carbon monoxide and hydrocarbons, expressed in g/km or g/mi, are given. The conversion factors for converting USA72 into ECE tests values are 0.800 and 2.55 for CO and hydrocarbons, respectively. The CO and hydrocarbon limit values as specified by the USA72-test are 24.4 and 2.12 g/km, while the respective values according to the ECE-test are 30.5 and 0.830 g/km. The conversion factors derived apply with sufficient accuracy for means obtained for a great number of cars, but not for individual cars.

23447 APTIC NO. 43432

Mortstedt, S. -E., K. -E. Egeback, and F. Karlsson

TESTING SMOKE MEASURING INSTRUMENTS. *(Kontroll av rokmatare). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-50, 25p., Feb. 19, 1969.*

Bosch EFAW 65 A and EFAW 68 A type filter blackening smokemeters were tested to determine the reliability of the evaluating unit, the tightness of the sampling pump, and the sampled gas volume. The readings of the evaluating unit were usually in good accordance with the values specified in the test procedure recommended by CEC (Co-ordinating European Council for the Development of Performance Tests for Fuels and Lubricants), but two out of the 14 instruments tested showed unacceptable deviations. An improved battery holder for the instrument is suggested. Seven out of the 14 sampling pumps were unacceptable due to leakage caused by the improper filter seal. A method developed for the determination of the gas volume sampled through the filter is described. The gas volume sampled by the different pumps varied from 258 to 304 cu cm with a theoretical stroke volume of 330 cu cm, which indicated considerable deviations in certain cases. The description of the test procedure as recommended by CEC is enclosed.

23448 APTIC NO. 43434

Mortstedt, S. -E., K. -E. Egeback, F. Karlsson, A. Lindgren, and R. -M. Egeback

GRAVIMETRIC MEASUREMENT OF THE DIESEL-ENGINE DUST CONTENT. *(Gravimetrisk matning av stoft i dieselavgaser). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-49, 19p., Oct. 22, 1969. 2 refs.*

Results of gravimetric dust measurements, carried out by means of glass-fiber filter paper on a preignition and a direct-injection diesel, and of smoke density measurements, performed by means of Hartridge and Bosch type smokemeters, are compared to corresponding results contained in a MIRA 1965/10 report. The results obtained for the direct-injection diesel were in good accordance with the above report regarding the relationship between dust concentration and smoke density, while the preignition diesel showed certain departures from this relationship. The test results for the two different cars are not directly comparable, since the preignition diesel was tested predominantly under part load, and the direct injection engine under full load conditions. The preignition diesel vehicle, when tested with light fuel, showed reduced dispersion of the test values, compared to standard fuel. The difference between maximum and minimum values of the dust content, as obtained for standard fuel was 15-28% of the maximum under load conditions, and 60% during idling. The smoke density measurements furnished, in good accordance with earlier investigations, slightly lower Hartridge values than those given in the MIRA report.

23449 APTIC NO. 43601

Mortstedt, Sten-Erik and K. -E. Egeback

STATISTICAL CONCEPT. A CONCISE DEFINITION OF STANDARD STATISTICAL TERMS. *(Statistiska begrepp. Korfattade definitioner av vanliga statistiska termer). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-59, 5p., May 6, 1970.*

The basic statistical terms used in measurement techniques within the areas of engine exhaust determinations and the general field of air pollution are defined. The defined terms include descriptive statistics, frequency chart, interval, histogram, summa polygon, cumulative frequency, location of statistical material given by arithmetic mean or median, spread given by the standard deviation of distribution, symmetric, normal and, transverse distribution, confidence degree, correlation and correlation factor, and regression analysis and curve.

23450 APTIC NO. 43453

Murozumi, Masayo, Seiji Nakamura, and Clair C. Patterson

DETERMINATION OF SODIUM IN ARCTIC AND ANTARCTIC SNOW STRATA; COMPARISON BETWEEN NEUTRON ACTIVATION ANALYSIS AND ATOMIC ABSORPTION ANALYSIS AFTER APPLICATION OF FREEZING CONCENTRATION TO SAMPLES. *(Nanhoku ryokyoku hyosetsu chu no natoriumu no bunseki: Chuseishi hoshaka bunseki to reito noshuku genshi kyuko bunseki no hikaku). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 19(8):1057-1063, Aug. 1970. 5 refs.*

Neutron activation of nuclides was applied to the measurement of sodium components at the ppb level in liquid samples by irradiating Na(23) with a thermal neutron to form Na(24). The detection limit of the element by this method is 0.5 ppb and the accuracy is plus or minus 5% in relative error. Sodium concentration in both polar snow strata was between 5 and 40 ppb, affected by yearly and seasonal atmospheric conditions. Sodium ions at such concentration levels can be qualitatively determined by the atomic absorption method, after an application of successive freezing concentrations to the samples. Sodium ions were enriched in the liquid phase but not in the ice phase. The overall detection limit by this method is 0.5 ppb and the accuracy is minus 10% in relative error. Sodium components in fine particles such as volcanic ashes and clays are occluded, unlike sodium ions, in the ice phase.

23451 APTIC NO. 43654

Newton, Amos S.

THE CONCENTRATION OF HIGH BOILING IMPURITIES FROM LOW BOILING COMPOUNDS BY REVERSE FLOW GAS CHROMATOGRAPHY. *California Univ., Berkeley, Lawrence Radiation Lab., Atomic Energy Commission Lab. Contract U-7405-eng-48, 20p., Dec. 1971. 1 ref.*

NTIS: LBL-283

The characteristics of gas chromatography peaks arising from various compounds when the column flow is reversed was studied. The results show that all compounds are eluted after reversal of the flow with the peak maximum at a time equal to or less than the time of flow reversal. The half width of the reverse peak is determined by a constant related to the number of plates in the column, and the square root of twice the time of flow reversal multiplied by the square root of the time of emergence of the compound when run in the forward direction. The method appears applicable to the concentration of trace high-boiling impurities in any matrix in which the bulk components can be rapidly eluted through a suitable column. (Author abstract)

23452 APTIC NO. 42694

Novakov, T.

PHOTOELECTRON SPECTROSCOPY FOR IDENTIFICATION OF CHEMICAL STATES. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 5p., 1971. 7 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1103.)*

The technique of x-ray photoelectron spectroscopy provides information about oxidation states of atoms in molecules. Quantitative elemental analysis can be performed using the same method. On the basis of this information, identification of chemical species is possible. In Pasadena, Calif. smog, sulfate predominates at night. At all other times, sulfite predominates. The oxidation of sulfite to sulfate may be concurrent with particle growth. Nitrogen is found in four different charge states. Nitrate is associated with particles greater than 2 micron. Nitrogen is, quite unexpectedly, most often found as amino-type and pyridine-type rather than as nitrate and ammonium.

23453 APTIC NO. 43234

Nusbaum, Henry

A REAGENT FOR THE SIMULTANEOUS MICROSCOPIC DETERMINATION OF QUARTZ AND HALIDES. *White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., DA Task 1VO14501B53A-13, ECOM-5085, 8p., Oct. 1966. 1 ref.*

NTIS: AD 644817

A reagent has been discovered whereby the techniques of dispersion staining microscopy and spot testing may be combined to distinguish halite (sodium chloride) from quartz in atmospheric dust samples. The reagent, referred to as the 4BR reagent, is a solution of ethyl salicylate, phenol, 1-bromonaphthalene, and mercurous perchlorate. The preparation of the reagent and its application are discussed. The use of 4BR improves the accuracy and ease of counting quartz particles in samples of atmospheric dust by excluding halite from the count. The reagent obviates polarized light and rotation of the microscope stage in distinguishing halite from quartz. The differentiation of these two minerals by dispersion staining microscopy is a problem with the smaller particles. The simultaneous determination of submicron particles of quartz, halite, other soluble chlorides, fluorides, bromides, iodides, and sulfates may be possible by modifying the composition of the reagent. (Author conclusions modified)

23454 APTIC NO. 43183

O Konski, C. T., M. D. Bitron, and W. I. Higuchi

LIGHT SCATTERING INSTRUMENTATION FOR PARTICLE SIZE DISTRIBUTION MEASUREMENTS. *Am. Soc. Testing Mater. Spec. Tech. Publ., no. 250: 2-28, 1959. 48 refs. (Presented at the Symposium on Instrumentation in Atmospheric Analysis, June 23, 1958.)*

An improved instrument is described for the characterization of particles suspended in gases by means of light scattering. It consists of a sensitive right-angle optical system with a photomultiplier detector, a coaxial flow system which facilitates variation of the particle concentration range, a photometer which continuously records the average light scattering signal, and a pulse analyzer for size discrimination of individual particles. The particle analyzer was calibrated with uniform polystyrene spheres from 0.33 to 1.17 micron in diameter, employing air as a scattering standard. The scattering intensity was approximately proportional to the square of the diameter. Resolving power was determined as a function of particle size, and the instrument was critically evaluated. A brief review of particle detectors is given. A versatile pulse height selector system is described. Some variations of the instrument are proposed. (Author summary modified)

23455 APTIC NO. 42664

Oshiman, T.

ON CONTINUOUS ANALYSIS OF SO2 IN EXHAUST GAS CENTERING AROUND JIS INFRARED GAS ANALYSIS METHOD. *(JIS sekigaisen gasu bunsekiho o chushin ni shita haigasu chuo no SO2 no renzoku bunseki ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 39(7):645-654, July 1972. 3 refs.*

The analysis method of total sulfur oxides and sulfur dioxide in exhaust gas promulgated in Feb. 1971 stipulates applicable analytical methods including the arsenazo III method, neutrualization method, and chloranil acid barium method for analysis of total sulfur oxides (SO2 and sulfur trioxide), iodine titration method, continuous analysis method (conductometry and infrared gas analysis), and detection tube method for SO2. General procedures for sampling and analysis of SO2 in flue gas from a heavy-oil fueled boiler by means of a NDIR (nondispersion infrared analyzer), a continuous gas analyzer are discussed. Gas should be sampled from a particular part of flue where the sampling tube and filter are easy to replace and maintain, where it is easy to keep warm or heated at 70-150 C, where the gas keeps on flowing consistently, and where the gas pressure and temperature fluctuate least. The sampling spot should also permit the installation of the analyzer as close to it as possible. The sampling tube should be corrosion-resistant such as a steel tube. For the filter, non-alkaline glass wool or quartz wool is used. The sampling pipe and duct leading to the cooler section of the analyzer should be heated or kept warm in order to avoid condensation of the water content of the gas. In the case of the NDIR analyzer, water content of the gas should be not only prevented from condensing but removed or kept at a fixed level to avoid overlapping of the spectra of SO2 and water content. The absorption spectrum of SO2 is affected by other coexisting gases. Degree of their interference was also discussed briefly. A structure diagram of the Horiba ESDA-200 gas analyzer, an NDIR type is also shown.

23456 APTIC NO. 42382

Ouellette, R. P. and R. S. Greeley

THE DESIGN AND USE OF AN AMBIENT AIR QUALITY DATA BANK. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 73- 76. (Dec. 6-11, Paper SU 18G.)*

In late 1969 the National Air Pollution Control Administration did not have the facilities for acquiring, reformating, and entering into a computerized data bank the large amounts of local and state pollution data. Thus, NAPCA requested the MITRE Corp. in McLean, Virginia, to collect all available local and state air quality measurements for the years 1965-1968. These data were required to answer a number of basic questions about the status of the country in regard to several pollutants, particularly sulfur dioxide and particulates. Therefore, MITRE s Environmental Systems Department personnel contacted all 250 local and state agencies and requested their cooperation in providing their data for use in a new centralized data bank. Data acquisition, formatting, data bank design and contents, output, and uses of the data bank are considered. The data bank was designed to be made up of three primary files: an hourly file, a daily file, and a monthly file. Measurements are arranged by pollutant type within these files. These files then are arranged by the state, county, and city which actually made the measurements.

23457 APTIC NO. 43163

Palanor, P. N.

SELECTIVE DETECTION OF AMBIENT CO WITH A MERCURY REPLACEMENT ANALYZER. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst of Electrical and Electronic Engineers, New York; Instrument Society of America, Pittsburgh, Pa; National Aeronautics and Spac Administration, Washington, D. C.; and National Oceanic and Atmospheric Administration, Rockville, Md., 5p., 1971. 10 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971.)*

A comercially available ambient carbon monoxide analyzer based on low yield mercury replacement is described. The instrument consists of two modules, a sampler and the analyzer. The sampler contains filters, a dryer, and a flow regulator. The analyzer contains a heat exchanger, the reactor, an atomic absorption mercury vapor detector, and a mercury stripper to remove mercury from the waste gas stream. The low yield

99<

reaction requires accurate pressure, temperature, flow, and surface area control to achieve stable operation. Measurements of the effects of interfering gases are reported. Hydrogen interferes to the extent of less than 10%. The mercury replacement method can improve sensitivity to carbon monoxide by 100-1000 over nondispersive infrared analysis.

23458 APTIC NO. 42436

Parker, J.

INSTRUMENTATION AND DATA-HANDLING IN AIR-POLLUTION RESEARCH IN THE UNITED KINGDOM. *Metron (Oxford), 3(9), 8p., Sept. 1971. 21 refs.*

Air pollution instrumentation is discussed under the following categories: grit and dust, suspended particulates, analytical techniques, data-handling techniques, meteorological equipment, data-transmission techniques, and siting and sampling. For grit and dust analysis, a directional dust gauge which collects dust samples from four quadrants can be employed. The samples are collected in four separate containers and can be analysed by a simple weighing or complete microscopic or analytical examination. Other dust-measuring instruments include thermal precipitators, electrostatic precipitators, and liquid impingers. Most of the routing work on the determination of suspended particulate pollution is carried out with a simple instrument which draws a metered volume of air through a filter paper; the amount is determined by a simple light reflectance method. Regarding analytical techniques, several models of infrared gas analysers exist for the determination of carbon monoxide; total hydrocarbons are almost universally determined by flame ionization techniques. Instruments capable of simultaneously determinations of low concentrations of sulfur dioxide, nitric oxide, nitrogen dioxide, and ozone are also available. For data-handling in the field, it is advisable to log data on battery-operated loggers, returning all the magnetic tape outputs to the central laboratory for translation or direct computer evaluation if the system is suitable. Meteorological equipment such as the tachogenerator and potentiometer have been used for switching sampling equipment by wind direction. In dispersion work, bivanes are used to measure horizontal and vertical turbulence. Regarding data-transmission techniques, central control systems that automatically interrogate equipment in the field are becoming increasingly available. Siting and sampling procedures by the operator are important since their legitimacy underlies the success of any measurements taken.

23459 APTIC NO. 43553

Parrish, Herman L. and A. W. Scholl

MASS SPECTROMETRIC ANALYSIS OF FLUE GAS. *Instrument Society of America, Pittsburgh, Pa., Proc. Instr. Soc. Am. Natl. Analysis Instr. Symp., Charleston, W. Va., April 30-May 2, 1962, p. 103-106. 6 refs.*

A measurement unit was designed for the determination of hydrocarbons in flue gas. A scrubbing and oxidizing system was devised to treat the flue gas sample before its introduction into the mass spectrometer. Mathematical calculations from the spectra were then used to determine mol% of carbon dioxide, carbon monoxide, nitrogen, oxygen, argon, and hydrocarbons present. The hydrocarbons included propane, butenes, butane, and pentane. The operating procedures, determination of the oxidation condition, scrubber efficiency, effects of hydrocarbons on the analysis, and experimental data and results are examined.

23460 APTIC NO. 43625

Parsons, R. H.

USEFUL INFORMATION FROM FLUE GASES. *J. Rec. Trans. Junior Inst. Eng., vol. 73:64-75, 1962.*

The percentage of carbon dioxide in flue gases is an indication of the operation efficiency of boiler furnaces in steam power plants. The value of the maximum theoretical percentage of CO2 (M), obtained from burning a particular fuel, can be obtained from an Orsat test. The ordinary portable Orsat apparatus consists of a water-jacketed measuring burette, graduated from zero to 100 cc together with three absorption pipettes and a levelling bottle. Equations are given for calculating the composition of the dry flue gases, by volume, as found by the Orsat test and for M. A more exact value for M can be found from a chemical analysis of the fuel, and the proper calculations are shown. The amount of excess air passing through a furnace may be a source of considerable less. Equations are presented for determining the percentage of excess air, using the reading from the CO2 meter and the value for M. Values for the weight of the air supplied, weight of air theoretically needed, wieght of the dry flue gases, weight of moisture in the flue gases, and the calorific value of coals and fuel oils can also be attained from the calculations and equations which are presented.

23461 APTIC NO. 42346

Paule, Robert C.

LOW LEVEL CALIBRATION MIXTURES FOR GASEOUS POLLUTANTS. *Anal. Chem., 44(8):1537-1539, July 1972. 2 refs.*

One response to the need for instrument calibration standards in the analysis of gaseous materials at the ppm and ppb level has been the development and certification of sulfur dioxide permeation tubes. These tubes, under constant temperature conditions, effuse SO2 at a given rate. By controlling the gas flow over the tubes, one can produce low level calibration standards. The permeation rates, however, are sufficiently temperature sensitive so as to require thermostating, and a period of several hours is needed for the establishment of steady state flow conditions. Permeation tubes have been limited in practical usage to the easily condensible gases. An alternate technique for the production of low level calibration mixtures for gaseous pollutants is presented, which consists of encapsulating, measuring, and storing a very small quantity of pure pollutant gas as a microbubble and then, at the time of analysis, of mixing the pollutant gas with a known large quantity of clean diluent gas. The mixing operation is done in a separate, passivated dilution cylinder. Sulfur dioxide, nitric oxide, and mixtures of SO2 plus nitric oxide gases have been encapsulated and stored for periods of six months or more without apparent deterioration, as indicated by lack of volumetric changes. Sulfur dioxide bubbles were mixed with nitrogen in a 2-l passivated dilution cylinder and quantitative measurements at the 0.5-1.5 ppm level were made using a commercial microcoulometer. Advantages of the microbubble technique are indicated.

23462 APTIC NO. 43684

Pecsar, R. E. and C. H. Hartman

AUTOMATED GAS CHROMATOGRAPHIC ANALYSIS OF SULFUR POLLUTANTS. *Analysis Instrumentation, vol. 9:1-4, 1971. 8 refs.*

The analysis of sulfur-containing pollutants is becoming mandatory in operations such as kraft paper mills, fossil-fuel burning power generation, and the petrochemical refining industry. Gas chromatography is a versatile tool for accomplishing this analysis in the normal ppb to ppm concentration range. Typically an all Teflon flow system is employed with detection by flame photometry. However, many procedures have become commonplace which do not actually represent optimum system operation. Results are presented showing individual component as well as total system optimization in relation to detector flow rates, electrical operating parameters, and noise reduction. The best column fabrication means as well as flow rate effect are discussed with methods for achieving optimum column and detector operation. For the low-level analysis of sulfur pollutants the importance of design attention to the entire system is stressed. The practical application of all these considerations was demonstrated with monitoring data obtained on a number

100<

of industrial stationary sources in the San Francisco Bay Area. An analyzer embodying the desired characteristics can be mated with an automated sequence programmer to provide continuous analysis and intermittent calibration completely unattended. (Author abstract modified)

23463 APTIC NO. 42897

Pernicka, John C. and Gerald F. McGowan

PORTABLE MASS SPECTROMETER/COMPUTER FOR AIR POLLUTION ANALYSIS AND MONITORING. *Advan. Astronaut. Sci. Suppl., vol. 26:161-176, 1971. 39 refs. (Presented at the American Astronautical Society and the American Institute of Aeronautics and Astronautics, Special Technical Event, Winrock, Ark., Oct. 30, 1970, Paper AAS70-073.)*

The mass spectrometer/computer system is a potential method for monitoring air pollution with accuracy and speed which were previously unavailable. The economic use of this system necessitates its installation in a ground or airborne mobile laboratory. Through the size, weight, and power reductions which have been achieved, an airborne installation is a practical technique for monitoring air pollution over a large metropolitan area at minimal cost. The resultant data, after being reduced through real-time data processing techniques, can be objectively displayed in a useful manner. Aside from the mass spectrometer system tested in this study, the following systems are also described and evaluated: magnetic analyzer, time-of-flight analyzer, radio frequency analyzer (Bennett Tube), Omegatron analyzer, Farvitron, quadrupole analyzer, monopole analyzer, and the three-dimensional quadrupole (ion cage analyzer).

23464 APTIC NO. 42420

Post, Roy G. and Morton E. Wacks

TECHNIQUES FOR SOURCE DETERMINATION IN THE TUCSON BASIN. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 410-418. 14 refs. (Dec. 6-11, 1970, Paper CP 19A.)*

Techniques to determine the sources of air pollution in the Tucson Basin are presented. Regression analysis, the least squares program, spectroscopic, gravimetric, and volumetric analyses, elemental analysis, and activation analysis are compared. Two approaches to computer processing of data obtained from elemental analysis of airborne particulate matter by neutron activation were successful. The first program, regression analysis, used less computer time and memory, but the second, least squares, gave more exact synthesis of the sample spectrum from the library spectra. Compared to other types of analyses, activation analysis is more sensitive for elements with high cross sections. Advantages of activation analysis include its speed, the fact that it does not damage the sample, and being less subject to human error. Its major disadvantage is that activation analysis cannot provide molecular information. Elemental analysis combined with mineral content information and total organic content provides sufficient information to relate particulates to their sources. (Author conclusions modified)

23465 APTIC NO. 43565

Price, Harold A. and Robert L. Welch

OCCURRENCE OF POLYCHLORINATED BIPHENYLS IN HUMANS. *Environ. Health Perspect., 1972: 73-78, April 1972. 16 refs.*

According to samples of human adipose tissue, 41% to 45% of the general population have levels of 1.0 ppm or more (wet weight) polychlorinated biphenyls (PCBs) with isomers from Aroclors 1254, 1260, 1262, and 1268. The presence of PCBs ranging from pentachlorobiphenyls to decachlorobiphenyl has been confirmed in selected samples by the use of combined gas chromatography-mass spectrometry, using a major peak after p,p-prime DDT (peak 12) as a reference peak for Aroclor 1260. The presence of p,p-prime DDE in the samples, as displayed by the chromatograms, was also noted. Procedures and results of thin-layer chromatography studies are briefly discussed.

23466 APTIC NO. 43540

Prostak, Arnold and Robert H. Dye

LONG-PATH SPECTROPHOTOMETRIC INSTRUMENTATION FOR IN-SITU MONITORING OF GASEOUS POLLUTANTS IN THE URBAN ATMOSPHERE. *(FINAL REPORT). Bendix Corp., Ann Arbor, Mich., Aerospace Systems Div., National Air Pollution Control Administration Contract CPA 22-69-55, Rept. BSR 3027, Rept. APTD-0889, 113p., Oct. 1970. 9 refs.*

NTIS: PB205256

A long-path spectrophotometric instrument is described for the quantitative measurement of ozone and other infrared absorbing gases (such as sulfur dioxide) in unconfined ambient air. A continuous variable filter wheel is used for wavelength selection from 7-14 micron. The instrument can be used with an active source at a range from 0.4 to over 1.6 km or it can be used to examine passively the radiant emittance from natural sources. A minicomputer is programmed to control the instrument and analyze the data in real time. The output of spectra or pollutant concentration is on a cathode ray tube, a teletypewriter, and/or punched paper tape. The instrument is sensitive to ozone concentrations ranging from 20 micrograms/ cu m to 2000 micrograms/cu m, with a measured noise of less than 4 micrograms/cu m and a time constant of about 2 min. (Author abstract modified)

23467 APTIC NO. 42775

Pursall, B. R. and C. D. Swann

AIR POLLUTION IN VEHICULAR ROAD TUNNELS. *Tunnels Tunnelling, 4(4): 340-345, July 1972. 23 refs.*

Air pollution caused by the combustion products from the exhausts of gasoline and diesel driven vehicles can be serious in a long road tunnel if the ventilation system is not designed to reduce the concentrations of the various gases and compounds to acceptable levels. The toxic effects of carbon monoxide, nitrogen oxides, lead compounds, sulfur oxides, and organic compounds, are summarized. The applicability of various methods of gas analysis to tunnel measurements is examined. Carbon monoxide detectors include infra-red analysers, catalytic analysers, and polarographic cells. A chemical-colorimetric detector was deemed less useful than an electrochemical analyser for detection of nitrogen oxides. Measurements of CO and nitrogen oxides were made in two tunnels. Typical emissions rates for diesel and gasoline vehicles are discussed.

23468 APTIC NO. 43642

Pustovoit, V. D., Yu. I. Sanaev, and S. A. Chelyshev

MEASUREMENT OF THE DUST CONTENT OF GASES. *Meas. Tech. (USSR) (English translation from Russian of: Izmeritel. Tekhn.), 14(8): 1262-1264, 1971. 1 ref.*

An apparatus consisting of a set of instruments mounted on a panel was developed for measuring gas velocity in dust; gas sampling; measuring temperature at a rheometer; determining filter resistance; measuring pressure before and after gas purification and atmospheric pressure; and determining humidity of an air-dust mixture within tests on dust collector efficiency. Apparatus design and operation, instrumentation, calibration, and calculations are reviewed.

23469 APTIC NO. 43603

Ramshaw, C.

A TECHNIQUE FOR DROP-SIZE MEASUREMENT BY DIRECT PHOTOGRAPHY AND ELECTRONIC IMAGE SIZE ANALYSIS. *J. Inst. Fuel, 41(330):288-292, July 1968. 5 refs.*

The photographic and droplet analysis techniques adopted during the first phase of a program to study the liquid injection process during rocket propellant combustion are described. Droplet photographs were analyzed using a Mullard Particle Size Analyzer. To obtain correct drop size distributions from spray photographs analyzed by this device, the clipping level must be set at a value midway between that which caused smearing and clipping of the clipped picture. Out-of-focus drops should be avoided if possible, but for cases where this is not practicable, a method is suggested which permits the results to be corrected provided the extent of the spray is large compared with the depth of focus. The recommended settings for the brightness, lens aperture, and photomultiplier gain controls on the Particle Size Analyzer are those which give the sharpest and clearest direct picture. Analysis of a direct spray photograph on high contrast film is not recommended because errors are unavoidably produced when the spray thickness exceeds the depth of focus. (Author conclusions modified)

23470 APTIC NO. 42312

Reusmann, G. and J. Westphalen

AN APPARATUS FOR AUTOMATIC ANALYSIS BY STRIPPING VOLTAMMETRY. *(Anordnung zur automatischen Ausfuehrung von inverspolarographischen Bestimmungen). Text in German. Fresenius Z. Anal. Chem., 259(2):127-128, 1972. 1 ref.*

An apparatus for automatic analysis by stripping voltammetry, including a flow cell, plastic capillary, and a pump with a throughput of about 1 ml/min is described. The sample to be analyzed is sent, together with nitrogen, through a thermostatically controlled, water-cooled glass coil where the bulk of the oxygen is removed, and a preset solution temperature is reached. After the nitrogen is separated, the solution is sent into a flow cell containing a capillary, from which one drop of mercury is transferred into an automatically controlled displacement burette. Timing adjustment and automatic range selection are provided. The above apparatus with process control has been successfully applied to routine determinations of lead, cadmium, and zinc in plant materials.

23471 APTIC NO. 43171

Rogers, Lewis H.

RELATIVE MERITS OF GAS CHROMATOGRAPHY, COLORIMETRY, AND SPECTROMETRY FOR AIR POLLUTION STUDIES. *Am. Soc. Testing Mater. Spec. Tech. Publ., no. 250:42-48, 1959. 11 refs. (Presented at the Symposium on Instrumentation in Atmospheric Analysis, June 23, 1958.)*

Five instruments useful in studying photochemical smog were compared. Two recording colorimeters for oxidant and nitrogen oxides had longer response times than the two spectrometric instruments; a long path infrared photometer and an ultraviolet photometer. A gas chromatograph was specific for many components, in automobile exhaust-purified air mixtures. However, it requires a preliminary concentration of the sample. All of the instruments are expensive and some, such as the long-path infrared and gas chromatograph, require personnel with special training. Nevertheless, these units proved extremely valuable in understanding the complex chemistry of photochemical smog.

23472 APTIC NO. 42449

Rose, Stuart Alan

ULTRAVIOLET SPECTROPHOTOMETRIC AND ATOMIC ABSORPTION SPECTROMETRIC STUDIES OF METHODS FOR THE DETERMINATION OF SULFUR DIOXIDE. *Wayne State Univ., Detroit, Mich., Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1969, 80p. 133 refs.*

Existing methods for the detection of sulfur dioxide are reviewed, including both qualitative and quantitative precedures. Modified ultraviolet spectrophotometric and atomic absorption spectrometric studies were made to ascertain their efficiency for the determination of SO2. The almost universal acceptance of the West and Gaeke method for the determination of trace concentrations of SO2 is due in great part to the effectiveness of the tetrachloromercurate(II) anion. The inherent simplicity and speed of the atomic absorption spectrometric method encouraged the investigation of the possibility of precipitating lead sulfate and measuring the excess lead by atomic absorption spectrometry. The indirect differential spectrophotometric determination of SO2 with hypobromite was investigated, as well as the spectrophotometric determination of SO2 using chloramine T. The simultaneous determination of carbon monoxide and nitrogen was investigated using the AEI MS-10 mass spectrometer. Reagents, apparatus, and experimental procedures are described. The use of polyethylene bottles for the storage of reagents to be used in ultraviolet spectrophotometry is discussed.

23473 APTIC NO. 43478

Ross, R. M.

A COMPARATIVE STUDY OF HIGH VOLUME SAMPLER DATA AND CONTINUOUS GRAVIMETRIC MEASUREMENTS. *Inst. of Environmental Sciences, Mt. Prospect, Ill., Proc. Inst. Environ. Sci. Annu. Tech. Meet., 18th, New York, 1972, p. 576-580. 4 refs.*

An automatic monitor for near real-time measurement of airborne particulates has been developed. The Particulate Air Monitor (PAM) automatically samples a large volume of air (17-35 ft/min), collects the particulates on a high efficiency glass fiber filter, automatically weighs the filter, and outputs a DC voltage proportional to the collected mass. Air flow is operator adjustable and then automatically maintained. The output is therefore readily converted to engineering units micrograms/cu m. Full scale capacity is 0-1.2 grams with plus or minus one milligram accuracy. A comparison is made between single point data from a Hi-Vol sampler and the continuous output from the PAM.

23474 APTIC NO. 43160

Ryazanov, V. A., K. A. Bushteuva, and Yu. V. Novikov

METHODS FOR THE EXPERIMENTAL DETERMINATION OF LIMITS OF ALLOWABLE CONCENTRATIONS OF ATMOSPHERIC AIR POLLUTANTS. *In: Limits of Allowable Concentrations of Atmospheric Pollutants. V.A. Ryazanov (ed.), Book 3, Washington, D. C., U. S. Public Health Service, 1957, p. 96-128. (Translated by B. S. Levine.)*

NTIS: TT 59-21175

Methods employed during the past several years in the experimental determination of limits of allowable concentrations of atmospheric pollutants are described. The principles on which such methods and procedures aare based can be classed into six categories: 1) methods for maintaining the constancy of pollutant concentrations under study; 2) methods for the determination of odor perception threshold and threshold effects of substances irritating to the upper tracts of the respiratory system; 3) pneumographic method for the determination of threshold effects of pollutants under study; 4) the optical chronary method for the determination of pollutants effect on threshold of reflex response; 5) adaptometric method for the determination of pollutants effect on threshold reflex response; and 6) methods for the study of small dose chronic poisoning effects on the higher nervous activity as manifested by pathologic changes in the reflex activity of laboratory animals.

23475 APTIC NO. 43290

Saalfeld, F. E., R. A Saunders, and F. W. Williams

ANALYSIS OF SUBMARINE ATMOSPHERES. *Report of NRL Progress, 1971, 9p., May 1971. 21 refs.*

Trace contaminants are of particular concern in nuclear submarines because some of the contaminants are either toxic or corrosive. While no single instrument or technique has been developed that can characterize all known contaminants, among the many Naval Research Laboratory-developed techniques of analysis are the gas chromatography-microcoulometer method, which is sensitive (from 10 ppb to 10 ppm) to all halogen-containing organic compounds except fluorides and the stop-flow, gas chromatography-mass spectrometry method, which permits the identification of the constituents of very complex mixtures. In a recent closed environmental evaluation, it was necessary to employ multiple techniques to analyze for dichloroacetylene, an extremely toxic gas. The instability of DCA was used as evidence for its presence. The total chloride content was determined by introducing the sample directly into a pyrolysis furnace coupled with a microcoulometer. The value obtained was compared to the sum of the chlorinated hyhdrocarbons found by using the profile method. A whole gas sample was then analyzed by mass spectrometry and no higher molecular weight chlorinated materials were detected. (Author abstract modified)

23476 APTIC NO. 42405

Sakai, Kaoru, Junya Sasama, Nobuharu Matsui, Kazuomi Kashiwazako, and Takeshi Arai

SYSTEMATIC MEASUREMENT IN ENVIRONMENTAL POLLUTION. *(Kankyo osen no keisoku to sono shisutemuka). Text in Japanese. Hitachi Hyoron, 54(6):80-85, June 1972. 8 refs.*

Various pollutant measuring instruments newly developed to comply with the requirements of regulations are reviewed. The flame ionization detector gas chromatography method using a column packed with activated carbon is applied to the detection of carbon monoxide and carbon dioxide at high sensitivity. Flame photometry is used for the detection of sulfur dioxide at concentrations as low as 0.005 ppm. A double wavelength photometer for the detection of total nitrogen oxides and a stock automatic monitor which can continuously measure the particle distribution of particulates and soots at high accuracy are examined. The standard concentrations of air pollutants for air pollution control in Japan the U.S.A., and the USSR are tabulated.

23477 APTIC NO. 43662

Salsbury, Jason M., James W. Cole, and John H. Yoe

DETERMINATION OF CARBON MONOXIDE. A MICROGRAVIMETRIC METHOD. *Anal. Chem., 19(1):66-68, Jan. 1947. 5 refs.*

A microgravimetric method was developed for analyzing low concentrations of carbon monoxide based on the oxidation of CO by air in the presence of Hopcalite and subsequent absorption of the carbon dioxide in tubes filled with Ascarite. The percentage of CO is calculated from the weight of the CO2 absorbed in the tubes. From 0.002 to 0.1% CO in air may be determined with an accuracy of 2%. Two samples of CO in air obtained from the National Bureau of Standards were used to evaluate the method. The CO content determined the microgravimetric method was within 1% of the bureau s value on the sample of 0.0025% and within 2% on the sample of 0.0080% CO.

23478 APTIC NO. 43291

Sawinski, Richard J. and J. David Wilson

EVALUATION OF COMBUSTION GASES FROM INDUSTRIAL INCINERATION. *Preprint, American Inst. of Chemical Engineers, New York, 33p., 1971. 11 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 69th, Cincinnati, Ohio, May 16-19, 1971.)*

Evaluation of combustion gases from industrial incineration is required to accurately define emission characteristics to determine compliance with emission codes and for evaluation and specification of system requirements for air pollution control equipment. An approach to incinerator emission testing is discussed Conduct of an emission evaluation program can be significantly affected by poor sampling port location. Conversion from actual to code excess air conditions can effectively increase emission rates. The basic components of the sampling equipment are a glass probe and impingers followed by a glass fiber filter. The impingers are of the modified Greenburg-Smith design capable of producing several inches of mercury pressure drop. A graphical method for determining isokinetic sampling conditions is outlined, and a successful technique is presented whereby particulate removal efficiency for design specification can be estimated using the modified impingers. Manpower and analytical resources are outlined, and a sampling technique is presented for evaluating combustion efficiency. (Author abstract modified)

23479 APTIC NO. 43303

Schefer, R. W., W. J. McLean, and R. F. Sawyer

DISPERSION IN COMBUSTION GAS SAMPLING PROBES. *Preprint, Combustion Institute, Western States Section, 25p., 1972. 5 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-15.)*

The problem of dispersion that occurs when a solute-solvent interface is transported by a laminar stream flowing down a straight horizontal tube was investigated. The approximate solutions available for flow condition of interest in combustion gas sampling were examined and these results were compared with experimental measurements. Concentration profiles over a range of Peclet numbers and tube lengths for cases of a single step change in concentration and a periodically varying concentration were measured by an infrared absorption technique. Allowing for the effects of natural convection, good agreement was obtained with Taylor s analytical solution for a step change in gas concentration and Philip s analytical solution for a periodically varying change in gas concentration. Calculations for typical combustion gas sampling probes are presented. Dispersion can be best minimized by reducing probe length and diameter.

23480 APTIC NO. 42438

Schwartz, D. M. and B. Ralph

THE ANALYSIS OF PARTICLE SIZE DISTRIBUTIONS FROM FIELD-ION MICROSCOPE DATA. *Phil. Mag., 19(161):1061-1068, May 1969. 8 refs.*

A method of obtaining second phase particle size distributions from field ion data is described which relies on the image persistences of particles during field evaporation sequences. In order to reduce the amount of manipulation on the micrographs, a statistical approach, which is independent of particle positions in the specimen, is adopted. The analytical method developed makes three approximations: that the tip shape does not change significantly during the investigation; that the spatial distribution of the particles is random; and that the shapes and orientations of the particles are all similar. The first two assumptions have to be considered when applying this approach to the analysis of field ion data. This method without significant modification can be used for obtaining size distributions from field ion micrographs of defects other than second phase particles, such as debris produced by radiation damage. The field ion microscope has the advantage of permitting investigation of finer microstructures than is possible by conventional transmission electron microscopy. (Author abstract modified)

23481 APTIC NO. 43445

Sfiras, J. and A. Demeilliers

PROPOSAL ON AN ODOR INTENSITY MEASURING METHOD. *(Tentatives de measure de l intensite de l odeur). Text in French. SCI (Soc. Chem. Ind., London)*

Monogr., no. 1:29-37, 1957. (Presented at the Society of Chemical Industry, Symposium on Molecular Structure and Organoleptic Quality, Geneva, Switzerland, May 2-3, 1957.)

An apparatus proposed for measurement of the relative odor intensity and practical tests are described. The apparatus is composed of a deodorized evaporating chamber, rotated and immerged in water of 22 C temperature, and a sampler for odorized air. A given amount of the odorous substance to be tested, spread on a pad, is placed into the evaporating chamber to evaporate over one hour. The sampling is made by means of a syringe permitting different dilutions. The odor panel of three persons is to characterize the sample as odorless, doubtful, not identifiable, or identifiable. Tests on chemically pure substances such as alcohols and aldehydes as well as on soaps gave largely coherent results.

23482 APTIC NO. 43586

Shaw, J. T.

REDUCTION OF ATMOSPHERIC POLLUTION. (FINAL REPORT). RESEARCH ON REDUCING EMISSION OF SULPHUR OXIDES, NITROGEN OXIDES, AND PARTICULATES BY USING FLUIDISED BED COMBUSTION OF COAL. APPENDIX 9. METHODS FOR DETERMINATION OF NITROGEN OXIDES. *National Coal Board, London (England), Fluidised Combustion Control Group, Office of Air Programs APTD-1084, Rept. DHB 060971, 18p., Sept. 1971. 10 refs.*

NTIS: PB 210675

Sampling and analytical methods for determining nitrogen oxide concentrations in flue gases are examined. The sampling train set-up and instrumentation, experimental procedures, and sample results are reviewed. The Saltzman method and an NOx sensor were used. The NOx sensor consists of an oxidizer to convert nitric oxide to nitrogen dioxide, a gas flowmeter, and a microammeter. Complete operating data, calibration, and variables are considered.

23483 APTIC NO. 42379

Silas, Robert S.

PORTABLE AIR POLLUTION DETECTOR. *(Phillips Petroleum Co., Bartlesville, Okla.) U. S. Pat. 3,653,840. 6p., April 4, 1972. 3 refs. (Appl. June 5, 1969, 11 claims).*

Conventional methods for the determination of olefins in a gas stream take a considerable amount of time, and must be conducted by highly skilled personnel in permanent laboratory installations. Examples of such analytical methods are fluorescent indicator absorption, mass spectrometry, chemical methods, and conventional chromatography. A procedure is described which comprises separating in a chromatographic column olefins having up to one more carbon atom than a predetermined number of carbon atoms from the remainder of the olefins in a stream that contains both olefins and nonolefins. The flow of the chromatographic elute is terminated at a time after the olefins having up to a predetermined number of carbon atoms, but before the olefins having one more carbon atom than the predetermined number, pass a given point. The presence of the olefins in the time separated stream is determined by such means as a bromine coulometric titrator. The apparatus for this procedure is portable and decreases the time necessary for backflushing the chromatographic column after completing a test.

23484 APTIC NO. 42769

Skoog, D. A., Ming-Gon Lai, and Arthur Furst

QUINOXALINE-2,3-DITHIOL AS A COLORIMETRIC REAGENT. DETERMINATION OF NICKEL IN AMMONIACAL SOLUTIONS. *Anal. Chem., 30(3):365-368, March 1958. 3 refs.*

Nickel concentrations as low as 0.03 ppm can be detected in aqueous ammoniacal solutions when quinoxaline-2,3-dithiol is used as the colorimetric reagent. The effect of such variables as ammonia concentration, reagent concentrations, age of the reagent solution, and stability of the color is considered. The best conditions allow the determination of nickel with a relative accuracy of 1%. Silver, copper, cobalt, and manganese interfere with the determination of nickel in the recommended procedure. Preparation of the calibration curve and analysis of the samples are discussed. All measurements were made with a Beckmann Model DU spectrophotometer using 1-cm Corex cells. (Author abstract modified)

23485 APTIC NO. 43579

Smith, William Hayden and J. J. Barrett

THE USE OF THE TRANSMISSION WINDOWS OF THE FABRY-PEROT INTERFEROMETER IN THE DETECTION OF RAMAN SCATTERED RADIATION FROM ATMOSPHERIC GASES. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 6p., 1971. 13 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1078.)*

The use of the Fabry-Perot interferometer as a filter with transmission windows occurring at regular intervals in wave numbers/cm provides a highly sensitive method for detection of atmospheric gases using their rotational Raman spectra excited by a suitable laser. Some of the operating advantages include signal gains of several orders of magnitude, a simple direct interpretation of the results in terms of the density and types of the gaseous constituents, size and weight reductions from conventional apparatus, ease of operation, and relative freedom from interference from other molecules in the scattering volume. This method is compared with the techniques that have been discussed in the literature by other workers in the field. (Author abstract modified)

23486 APTIC NO. 43572

Steen, B.

PROBLEMS IN MEASURING PARTICULATES IN AMBIENT AIR. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 5:26 to 5:30. 2 refs. (Sept. 1-6.)*

In most cases measurement is made of the mean dust concentration in the air over a certain period. This measuring time should be made short enough to ensure that the standard deviation of the measure and concentration shall not be appreciably affected by the length of that time. The actual sampling can be affected in various ways: by direct analysis in the air, by use of a sedimentation vessel, or by exhaustion of air samples. After admission and before particles reach the position where they are separated or analyzed, there is a risk of deposition on the hose walls and such places. The problem is best minimized by using short tracks to the separation or analysis point. Separation of particles is accomplished by filters, dry impactors, wet impactors, thermal and electrostatic separators, and contrifugal methods. Modern practice prefers the recently developed beta-absorption method for particle analysis. Absorption and scattering of light by particles can give some idea of their total quantity and particle size distribution. The disadvantage of purely optical measuring techniques is that no means are available for subsequent check of the results obtained.

23487 APTIC NO. 42360

Tani, Manabu

DETERMINATION OF METALS IN ATMOSPHERIC ENVIRONMENT AND THE PRACTICE OF METHODS.

(Kankyo taikichu no jukinzoku no sokuteiho to sono shuho no jisasai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 8(6):551-556. June 1972. 15 refs.

Phosphorescence spectrophotometry and atomic absorption spectrophotometry were used for the analyses of trace metal content in air. A high volume sampler equipped with a glass fiber filter was used for sampling air at a suction rate of 1.4 cu m/min for 24 hr. Due to the complicacy of the spectra of metal content in air, a phosphorescence spectrophotometer of high dispersibility was required. A 110 V DC arc source was used, and the exposure time was 30 sec. This method was applied for the analyses of cobalt, copper, iron, manganese, nickel, tin, and vanadium. Atomic absorption spectrophotometry showed higher sensitivity on metal analysis, and it was applied to the analyses of cadmium, lead and zinc. The detection wavelength was 2288 A for Cd, 2833 A for Pb, and 2138 A for Zn. The metal concentrations in air of 11 cities in Japan measured by these two methods are listed. The limits of detection of the two methods on 13 metals are compared.

23488 APTIC NO. 42695

Tombach, Ivar

MEASUREMENT OF SOME OPTICAL PROPERTIES OF AIR POLLUTION WITH THE INTEGRATING NEPHELOMETER. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 7p., 1971. 12 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1101.)*

One of the more dramatic effects of air pollution is its effects on clarity and color of the atmosphere. Measurements of the light scattering properties of the atmosphere have been made in order to characterize the atmospheric aerosol. The magnitude of the scattering, as measured by an integrating nephelometer, has been related to the visibility and to the mass concentration of suspended particulates. Scattering measurements at several wavelengths have been correlated with the particle size distribution, and the variation of scattering with humidity has been used to study the aerosol chemical composition. Use of the integrating nephelometer in vehicles and aircraft to map distributions of particulate matter and to study the transport of particulate air pollution is described. (Author abstract modified)

23489 APTIC NO. 42870

Torborg, Ralph H.

EFFECTIVITY OF AN EXHAUST EMISSIONS ANALYZER FOR THE AUTOMOTIVE SERVICE ENVIRONMENT. *Preprint, p. 145-154, 1971. 3 refs. (Presented at the Reliability Maintainability Conference, Annual, 10th, Anaheim, Calif., June 28-30, 1971.)*

An Exhaust Emissions Analyzer for measuring carbon monoxide and indicating hydrocarbons was developed for the automotive dealership service environment. The principle of operation of the analyzer is based on ultraviolet emission. When a combustible gas is oxidized on a hot filament, ultraviolet light is emitted in proportion to the concentration of the combustible gas. A single detector cell is used to sense both CO and hydrocarbons. The instrument has advantages with regard to cost, simplicity of operation, and ease of calibration. Discrimination between carbon monoxide and hydrocarbons is achieved by a dual measurement involving a subtraction technique using an electronic memory and a hydrocarbon filter. The exhaust sample is cleaned of particulate matter and condensibles prior to entry into the instrument. To do this, the auto exhaust is first bubbled through water and then passed through a particulate filter. Standardization of the instrument in the field is achieved with a built-in calibration gas (propane-air mixture).

23490 APTIC NO. 43422

Toth, R. A. and C. B. Farmer

GLOBAL STUDIES OF ATMOSPHERIC POLLUTANTS AND TRACE CONSTITUENTS. *Preprint, American Chemical Society, Washington, D. C., American Institute of Aeronautics and Astronautics, New York, N. Y., Environmental Protection Agency, Washington, D. C., Institute of Electrical and Electronic Engineers, New York, N. Y., Instrument Society of America, New York, N. Y., National Aeronautics and Space Administration, Wasington, D. C., 7p., 1971. 2 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, AIAA Paper 71-1109.)*

A high-speed, high-resolution, Fourier interferometer operating in the 1-5 micron spectral region can best meet the needs for remotely detecting and monitoring various molecular species in the atmosphere. An operational breadboard version of this instrument exists. Spectra obtained from ground sites in the Los Angeles area demonstrate the presence of several gases in the atmosphere. Two spectra in the 2.1 and 2.3 micron regions, respectively, are presented from which relative abundances of carbon dioxide and carbon monoxide are derived. Ground-based operations and aircraft flight with the present instrument verify the potential operational capacity for a satellite instrument. Such an instrument could be used to map the spatial and temporal variations of atmospheric constituents as they move from sources in industrial regions as well as possible sources in the ocean, and also to identify the sinks of CO and CO2. (Author abstract modified)

23491 APTIC NO. 42728

Ushakov, S. G.

DESIGNING MANIFOLDS FOR UNIFORM DISTRIBUTION OF DUST-LADEN GAS FLOW TO DIFFERENT BRANCHES. *Thermal Eng. (English translation from Russian of: Teploenergetika), 14(7):56-59, July 1967. 3 refs.*

The non-uniform distribution of dust of different particle sizes in a distributing manifold of variable cross-section was investigated. Dust distribution tests were conducted at air velocities of 6 and 12 m/sec. The concentration of dust at the inlet to the manifold varied from 2-200 g/cu m. Dust was fed into the air flow by two feeders: a vaned feeder for the lower concentrations, and one with a fluidized layer for high concentrations, at a distance of 20 manifold diameters from the inlet to the distributing manifold. To determine the dust distribution to each branch, a cyclone, 150 mm in diameter, was fitted to each outlet. Constant air and dust flow rates were maintained. After a test the dust trapped in each cyclone was weighed. It was found that the predominant influence on dust distribution is exerted by the dust size; the transportation rate and geometrical dimensions of a plant exert less influence. In investigations on geometrically similar models of the manifolds used for distributing a dust-laden gas flow to the individual units, the geometrical dimensions of the plant, dust particle sizes, dust density, density and viscosity of air, and the rates of transportation in the model and the full scale plant are to be considered.

23492 APTIC NO. 42322

Vishnevskiy, Ye. P.

AN ADJUSTABLE SINGLE CASCADE IMPACTOR. *(Reguliruyemyy odnokaskadnyy impaktor). Text in Russian. Gigiena i Sanit., 37(5):72-77, July 1972. 13 refs.*

An adjustable single cascade impactor, designed to sample aerosols within a fraction of 1-40 micron, is described. The adjustable parameters are the nozzle diameter (1.2, 1.5, 2, 3, 6, and 12 mm), the distance from the nozzle to the screen (3, 4, and 6 mm) as well as the air flow (5, 10, and 20 l/min). The nozzle length was designed to stabilize the air and particle flow speed. The calculations were performed according to the Ranz-Hofelt method. It was possible to increase the nozzle-screen distance to nozzle diameter ratio to 2-2.5 without causing distortion in the results. The effective interception diameter was the most reliable characteristic of the particle fraction composition. The impactor was calibrated by means of oil aerosol deposited at 50% efficiency on glass coated with dimethyldichlorosilane. The impactor provides ample possibilities of particle weight, number, activity, and chemical studies with increased accuracy and improved coverage of the total particle size range compared to multicascade impactors. The impactor can be used for calibrating photoelectrical and other aerosol counters as well as for selective sampling.

23493 APTIC NO. 42727

Vnukov, A. K., A. A. Goikhman, L. G. Madoyan, and Yu. A. Migalin

DETERMINATION OF UNBURNT CARBON WHEN BURNING FUEL OIL. *Thermal Eng. (English translation from Russian of: Teploenergetika), 13(9):61-64, 1966. 5 refs.*

Two methods for determining unburned carbon from fuel oil are discussed. In the VTI method the amount of unburned carbon is determined by the residual weight after calcining an ash-free filter through which a measured volume of furnace gases is passed, pre-washed in vessels filled with water and kerosene. The essence of the new ORGRES method is eliminating the effect of the quantity and properties of the ash, presence of sulfuric acid, and the variations in weight of the filter in the VTI method. Unburned carbon is determined by the amount of carbon dioxide obtained from calcining an asbestos filter through which a measured amount of flue gas is passed for 15 min. Neither method can be used effectively in practice since the duration of determination by the VTI and ORGRES methods is approximately 2 hr and 1 hr, respectively. Operating conditions giving rise to increased unburned carbon and dangerous deposits of soot can be allowed only for a short time. To insure the required safety of operation, a method of continuous and rapid determination of unburned carbon is necessary.

23494 APTIC NO. 42734

Vonnegut, Bernard

MEANS FOR MEASURING INDIVIDUAL AEROSOL PARTICLES. *(General Electric Co., New York) U. S. Pat. 2,702,471. 5p., Feb. 22, 1955. 3 refs. (Appl. March 27, 1951, 4 claims).*

Simple and reliable means are presented for detecting, counting, and determining the size of individual aerosol particles. The method comprises changing the state of the aerosol particles. By causing them to impinge upon an electrically energized, conductive, temperature sensitive element, the particles are vaporized. The particle concentration, number, and size may be determined by selectively detecting the impulsive change in the energy dissipated by the temperature sensitive element when an individual particle is vaporized.

23495 APTIC NO. 42717

Walde, Nils

REPORT ON A TRAVEL MADE TO THE USA, JUNE 4-26, 1969. *(Reserapport- USA-RESA, 4.6. - 26.6.1969). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-37, 27p., Nov. 20, 1969. 7 refs.*

Experiences gained during a visit to the USA in the fields of vehicle emission inspection procedures, emission test technique, and air pollution monitoring are presented. Rapid inspection methods are reviewed. Idling tests cover carbon monoxide and hydrocarbon measurements, while constant load tests, performed on chassis dynamometers, are of little relevance. Simplified cycle tests on hot engines, using a computer for diagnostic purposes, can be performed in about one minute. A systematic tune-up routine is promising in regard to exhaust control and trouble-shooting. An eight-mode-cycle, including retardation from 20 to zero mph as well as proportional ampling and CO, hydrocarbon, nitric oxide, and nitrogen dioxide determination, will be introduced as a complete test procedure for 1972 car models. A selective electrochemical analytic instrument for nitrogen oxides and sulfur dioxide, and a catalytic Autoscan Model 610 Analyzer for hydrocarbon CO, or CO plus hydrocarbon determination are described. Abating nitrogen oxides emissions, a basic goal in emission control, can be reached by applying recycling, leaner mixture, reduced compression, delayed ignition, water injection, or catalytic afterburning. A combination of rich mixture and catalytic afterburning is regarded as the most inexpensive pollution control measure. A manifold reactor developed by DuPont is described. To avoid driveability problems, the proportion of the exhaust gas recycled should not exceed 14%. Automatic stationary and mobile laboratories for air pollution monitoring in New York City are described.

23496 APTIC NO. 43258

Ward, George H., Robert M. Burton, and Ferris B. Benson

A VERSATILE DATA ACQUISITION AND RETRIEVAL SYSTEM FOR ENVIRONMENTAL MONITORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., March 1972. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami Beach, Fla., June 18-22, 1972, Paper 72-24.)*

A versatile data acquisition system was developed specifically for real-time remote monitoring of various analog and digital data generated by environmental monitors. There are two major components in the system: a field station which collects and stores data from various sensors on magnetic tape cassettes; a base station which is utilized to retrieve data collected on the magnetic tape at the remote field station. Any number of field stations may be used, and they may be operated independently of the base station. The normal mode of data retrieval is over the standard dial telephone network. When the telephone connection is established, the base station commands the field station to transmit its stored data back to the base station where the information is recorded on computer-compatible magnetic tape. The received data may also be viewed simultaneously (as it is received) on a CRT display. In the independent mode of operation, the field station collects data automatically in the normal fashion, but the magnetic tape record is mailed back to the central base station where the information is transferred to computer-compatible magnetic tape for processing.

23497 APTIC NO. 43476

Weiss, Morris

REMOTE MEASUREMENT OF SO2 AND PARTICULATE CONCENTRATIONS IN SMOKE STACK EFFLUENTS USING INFRARED OPTICAL SENSING TECHNIQUES. *Inst. of Environmental Sciences, Mt. Prospect, Ill., Proc. Inst. Environ. Sci. Annu. Tech. Meet., 18th, New York, 1972, p. 368-376.*

A field trip was made to a power plant and remote infrared measurements were made on the smoke stack plume using a Barnes R8T Radiometer with a variety of filters, and a PRT-5 Infrared Thermometer. No in stack measurement data was available from the power plant. The plume temperature was determined radiometrically to be 144 C. The estimate of plume temperature from power plant information is 130 C. The emissivity of the particulate matter was determined radiometrically to be 0.12 with a corresponding concentration of 0.015% by weight. Calculation of particulate concentration from independent data resulted in a value of 0.016% or the same as the radiometric determined value. The emissivity of the sulfur dioxide was determined radiometrically to be 0.50 with a corresponding concentration of 0.278% or 2780 ppm. Calculation of SO2 concentration from independent data resulted in a value of 2620 ppm which is close to the measured result. Theoretical aspects of remote optical pollutant detection are discussed. (Author abstract modified)

23498 APTIC NO. 43156

Welch, Edwin C.

DESIGN OF AN OPTICAL SYSTEM FOR COUNTING AND SIZING AIRBORNE PARTICLES. *Instrument Society of America, Pittsburgh, Pa., Instr. Soc. Am. Natl. Instr. Analysis Symp. Proc. Charleston, W. Va., April 30-May 2, 1962, p. 173-178. 7 refs.*

An optical system designed for counting and sizing airborne particulates is examined with respect to basic theory, design considerations, operation, and electronic circuitry. The optical monitor, based on the light scattering principle, is composed of a condensing-projection lens arrangement and a collecting lens arrangement and can easily detect particles 0.32 micron in diameter. By using collection lenses of higher gathering power, a much higher signal-to-noise ratio is attained, resulting in greater sensitivity. The resolving power is also greatly increased. Many of the nonlinearities between scattered light intensity and particle diameter squared have been reduced to a point where, with fairly narrow size ranges, the scattered intensity is linear with particle area.

23499 APTIC NO. 43228

Wiklander, Gosta

MEASUREMENT OF THE EMISSION OF HYDROGEN SULPHIDE AND SULPHUR DIOXIDE FROM THE SODA BOILERS IN SULPHATE MILLS. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 2:13 to 2:22. (Sept. 1-6.)*

Experiments in laboratories and in the field yielded certain information concerning the selection and processing of gas samples prior to analysis. The gas sample should be taken after going through the electrostatic precipitator, preferably after the flue gas fan. There should be no filter on the outlet pipe inside the waste gas duct because the filters may become clogged and gas reactions may take place within the filters. The actual gas sample pipe must be kept as short as possible, and it must be heated and insulated so that the temperature of the pipe always is above the dew point. It is important to obtain rapid cooling of the gas with minimum contact time between gas and condensate. The cooler must be provided with a proper drop-separator with suitable trap for the condensate, for example a mercury lock. From the cooler, the gas is led to a filter and then to a gas pump which forces the gas sample to the analyzing apparatus. A tape apparatus is the recommended method of analysis for hydrogen sulfide. An automatic titration apparatus may also be employed. During the greater part of a period of 10 days, a soda recovery unit showed a low H2S emission, 0-3 ppm. Duration of emission peaks may be from 10 to 15 min, and in adverse cases up to several hours. During the 10 days, the emission value of 10 mg/cu m was exceeded for a total of 520 min, or about 3.6% of the operation time. Operation with low emission is dependent upon good supervision of unit operation. A new recovery unit was tested for emissions at a variety of air flows. At 160,000 cu m/hr the H2S emission was around 1 mg/cu m. When sulfate addition to the unit was stopped, there was a relatively rapid reaction in the form of increasing H2S content. The sulfur dioxide in the waste gases of recovery units is between 500 and 1000 mg/cu m.

23500 APTIC NO. 42984

Wilson, Kent D. and Dennis A. Falgout

A NEW APPROACH TO ISOKINETIC NULL PROBE DESIGN. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1972. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, Paper 72-32.)*

A null probe of radical new design for sampling isokinetically the particle-laden gas stream in particulate-sampling operations is discussed. The design eliminates the main problem encountered in previous models, that being the accurate measurement of static pressure. In the new probe, a small static probe is located in the center of the nozzle and another on the outside and the static taps of both tubes are located in the plane of the probe inlet. This ensures that static pressure changes which occur inside and outside the probe due to the disruption of fluid flow by the probe itself will not affect the sampling rate accuracy. A consideration of fluid theory shows why previous designs have met with limited success and why the new design overcomes these deficiencies. A prototype was constructed and tested in both a wind tunnel and a field sampling situation. Performance was excellent in both circumstances, with errors generally less than 3%. It is believed that the errors were due to poor instrument precision rather than design inadequacies. (Author abstract modified)

23501 APTIC NO. 42672

Yamazaki, H. and Y. Kurita

MEASUREMENT OF FLOW QUANTITY FOR POLLUTION CONTROL AND SAFETY. *(Kogai boshi to anzen no tame no ryuryo deisoku). Text in Japanese. Otomeshon (Automation), 17(4):39-42, Apr. 1972. 3 refs.*

Use of a flowmeter is becoming important for operating safety equipment and systems and for effective pollution control at pollution sources. The tecniques to measure flow quantity of flue gas and other exhaust gas as well as waste water have become as essential as the continuous analysis of such wastes in the light of meeting today's strict environmental criteria. New flowmeters designed for prevention of pollution and preservation of safety are discussed. The flare stack gas flowmeter is an eddy flow meter used in the stacks of a petrochemical or oil refinery plant. It covers a wide range of flow quantity, takes changes of gas composition, and ensures low pressure loss. The purge-type eddy flowmeter was designed for measurement of emission gas from the boiler, incinerator, or blast furnace. Electromagnetic flowmeters are used in blast furnaces. This flow meter is designed to detect leakage in early stages. Eddy current-type flowmeter is used to detect abnormality in a pile. In this connection, the operating mechanism of the probe type flowmeter used with PFR, a reactor operating in England, was shown in a block diagram.

23502 APTIC NO. 43564

Yobs, Anne R.

LEVELS OF POLYCHLORINATED BIPHENYLS IN ADIPOSE TISSUE OF THE GENERAL POPULATION OF THE NATION. *Environ. Health Perspect., 1972: 79-81, April 1972. 6 refs.*

Analytical results for 637 samples reported by the Human Monitoring Survey are summarized. The samples were collected from 40 pathologists in 38 cities distributed over 18 states and the District of Columbia. Of the 637 samples reported, 198 (31.1%) contained measureable amount of polychorinated biphenyls and 125 (19.6%) contained trace amounts, with the balance being negative. Positive samples came from every hospital, city, and state sampled. It appears that these materials are widely found in the population. Details of distribution by sex and race, collection procedure, and diagnostic groups are summarized.

23503 APTIC NO. 42691

Yoneda, Tokihiko

SO2, NO2 POLLUTION MEASUREMENT EQUIPMENT USING A DETECTOR. *(Kenchikan ni yoru SO2, NO2 kogai sokuteiyo kiki ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 39(6): 594-596, June 1972.*

The characteristics of sulfur dioxide and nitrogen dioxide detecting tubes, which can detect a concentration up to several hundred ppm, are discussed. Purple reagent is packed in a glass tube. The purple color is changed to white upon absorption of SO2, and the length of the white color layer is proportional to the SO2 concentration. Improvement of the sensitivity allows the detection of concentrations from zero to several ppm. The acidic color of the pigment is used for the detection of NO2. The white color of the reagent turns to dark orange upon absorption of NO2. Concentrations from 0.01 to 2 ppm can be detected with a 2 l gas sample. The detecting tube can be applied to the measurement of SO2, at 0 to 3000 ppm, from stack gases by direct stack sampling. The main tube is usually heated at 100 to 120 C to prevent fog formation in the tube. Tests at an oil refinery and at a power plant show that the detecting tube gives consistent results.

23504 APTIC NO. 43570

Zurlo, N.

METHODS FOR THE DETERMINATION OF FLUORINE COMPOUNDS IN THE WORKING AND ENVIRONMENTAL ATMOSPHERE OF ALUMINUM REDUCTION PLANTS. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers (AIME), New York, N. Y., 15p., 1971. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 100th, New York, Feb. 26-March 4, 1971.)*

During electrolytic production of aluminum, gases and dusts may escape into the atmosphere and, of these, dusts of solid fluorine compounds and of its gaseous derivatives are of special interest. Fluorine checks must be performed in the air around the plants, in the area of the work departments, in the urine of the workers, and in plants. Routine methods for accomplishing these analyses use both microdiffusion with sodium hydroxide absorption and colorimetric analysis and an electrode sensitive to fluorine ions. Equipment, calibration, and analytical procedures are described.

AIR QUALITY MEASUREMENTS

23505 APTIC NO. 42921

THE CONCENTRATIONS OF ATMOSPHERIC PARTICULATE MATTER IN SELECTED URBAN AND NONURBAN LOCATIONS. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 3, p. 17-30. 10 refs.*

Data on levels of particulate matter, benzene soluble organic matter, beta-radioactivity, nitrates, sulfates, iron, and lead from a large number of urban National Air Sampling Network stations are presented for 1967 and 1958, as well as similar data from a smaller number of nonurban stations for 1958. In each table the following information is listed on a yearly basis: number of samples collected; minimum, maximum, and arithmetic mean concentrations; and geometric mean concentrations and standard geometric deviations. Using the geometric mean and standard geometric deviation, a straight line can be plotted on log probability paper which reconstructs the distribution of sample data, and from which can be made approximations of concentrations which can be expected to occur with a specific probability. The primary objective of the Network is to determine trends in pollution levels in a given community rather than to determine differences between communities.

23506 APTIC NO. 43316

Japan Environmental Agency, Tokyo, Bureau of Air Quality

RESULT OF MEASUREMENTS BY NATIONAL AIR POLLUTION SAMPLING NETWORK, FISCAL YEAR 1970. *(Showa 45 nendo. Kokusetsu Taikiosen sokutei-mo (NASN) Sokutei kekka). Text in Japanese. 197p., Jan. 1972.*

Air pollution measurements are given for the National Air Pollution Monitoring Station in 1970. The amounts of sulfur oxides, nitrogen oxides, oxidants, carbon monoxide, and hydrocarbons were measured by continuous measurement. The amounts of cadmium, cobalt, copper, iron, manganese, nickel, lead, tin, vanadium, and zinc in dust were measured by atomic absorption spectrometry and luminous spectrometry.

23507 APTIC NO. 43317

Kagawa Prefecture (Japan)

INVESTIGATION OF ATMOSPHERIC AIR IN SAKAIDE AND MARUGAME AREAS. *(Sakaide, Marugame chiku kankyo taiki chosa hokokusho). Text in Japanese. 127p., March 1972.*

Measurements of meteorological conditions and atmospheric contaminants were carried out during the period from Nov. 6-13, 1971 in order to grasp the quality, quantity, and extent of air pollution in Sakaide and Marugame areas of Kagawa Prefecture and to obtain the data necessary for preventive measures. Meteorological studies were undertaken by recording wind vanes and anemographs at five spots. Oxides of sulfur were measured by sequential air samplers at 12 measuring spots around factory districts, and the collected gas was analyzed by the P-rosanilin method. Suspended particulates were continuously collected by high volume air samplers at 12 measuring spots for 7 days, and the quantity of suspended particulates, benzene soluble matter, water soluble matter, sulfuric and nitric acid radicals, and metallic elements were analyzed. Oxides of nitrogen were measured by air samplers at six spots around the factory district for 8 hours a day for 7 days, and analyzed by means of the Saltzman method. Fluorine compounds were measured by low volume air samplers and the alkali filter paper method at five spots around the factories for 8 hours a day for 7 days. The amount and method of fuel consumption in industries were also examined.

23508 APTIC NO. 43322

Osaka Prefectural Environmental Pollution Control Center (Japan), Research Section

REPORT ON MEASUREMENT RESULTS AT NATIONAL AIR POLLUTION MONITORING NETWORK OSAKA STATION, FISCAL YEAR 1969. *(Zenkoku taikiosen sokutei-mo Osaka sokutei-sho Showa 44-nendo sokutei kekka hokokusho). Text in Japanese. 327p., July 1970.*

Daily and monthly averages of sulfur oxides, suspended particulate matter, nitrogen oxides, carbon monoxide, oxidants, hydrocarbons, and wind velocity and direction are reported. In January, sulfur oxides had a monthly mean value of 0.12 ppm, which was the highest recorded. Twenty-five days in January, 27 in February and November, and 26 days in December had a daily mean value of 0.05 ppm and over. Suspended particulate matter had the highest mean value per month of 0.256 mg/cu m in December. Sixteen hours in this month had an hourly mean value of 1.0 mg/cu m and over. The highest monthly mean value of nitric oxide was recorded in December as 0.188 ppm, and that of nitrogen dioxide was 0.028 ppm in May. The NO tended to have peaks twice a day in fall and winter, but NO2 level remained low and unchanged throughout the year. The highest mean value of carbon monoxide per month was 4.3 ppm in November, but the frequency of recording 10 ppm and over was low, and, therefore, the environmental standard has been met. Daily changes of carbon monoxide showed a tendency to have peaks twice a day. The highest mean value of oxidants per month was 0.068 ppm in September, and the daily average was as high as 0.118 ppm on July 15, because an hourly mean value of 0.20 ppm and over continued for 5 hours.

23509 APTIC NO. 43179

Bogen, Norma, Donald Shepard, Steven Fosburg, Helen Mansfield, Johnny Kirkland, and Katherine Mickey

COMPUTER MAPPING AS AN AID IN AIR POLLUTION STUDIES. VOLUME II. INDIVIDUAL REPORTS. REPORT A. ST LOUIS REGION STUDY. PART I. *Harvard Univ., Cambridge, Mass., Graduate School Design, National Air Pollution Control Administration Demonstration Grant 68A-2405D, APTD-0776, 72p., April 1970. 4 refs.*

NTIS: PB 204182

St. Louis and contiguous counties in Missouri and Illinois were included in a study to relate air pollution variables to demographic parameters. The following activities were undertaken: talley of air pollution complaints; inventory of pollution sources; indication of growth trends; compilation of meteorological, air quality, sociological, and economic data; conduction of odor survey; evaluation of existing air quality standards; and preparation of guidelines. Maps of the station distribution networks for each kind of pollutant to be measured were prepared. A series of computer maps were drawn using the data collected to determine the relationships between the levels of pollution and demographic variables. The highest levels of sulfur dioxide occurred in the downtown St. Louis area and increased in this area from the first to the second winter studied. The greatest increase occurred in the vicinity of Venice and Granite City, Illinois, in a portion of East St. Louis and in a portion of Centreville. In demographic parameters, the boundary of the city of St. Louis often acts as a border between higher and lower values. The inner areas have a greater population density; more poor, aged, children; and non-whites. Percent families with incomes less than $3000 and percent housing units deteriorating and dilapidated had the highest correlation with high sulfur dioxide concentrations. There appeared to be no strong correlation beyween population housing variables and suspended particulate data. The method of approach is equally applicable to other metropolitan areas or to smaller or larger areas. There is a need for current data as well as time series data.

23510 APTIC NO. 43353

Bridge, Dennis P. and Morton Corn

CONTRIBUTION TO THE ASSESSMENT OF EXPOSURE OF NONSMOKERS TO AIR POLLUTION FROM CIGARETTE AND CIGAR SMOKE IN OCCUPIED SPACES. *Environ. Res., 5(2):192-209, June 1972. 23 refs.*

Because it was suspected that a significant portion of the total pollutants inhaled by an urban dweller may be contributed by pollution in occupied spaces where smokers are present, a study was performed to determine pollutant concentrations in occupied ventilated spaces. Carbon monoxide was continuously monitored with a Beckman infrared analyzer and was used as a tracer for suspended particulates matter generated from cigarette and cigar smoke. Experiments were first performed in an exposure chamber with a smoking machine of new design. Pollutants were then monitored in occupied spaces with known occupancy levels and occupancy smoking rates. Measured pollutant concentrations and associated doses were compared to Threshold Limit Values for occupational exposures and Federal Ambient Air Quality Standards for outdoor air. An equation proposed by Turk for predicting pollutant concentrations from tobacco smoke generated in ventilated spaces was found to be a reliable predictor of carbon monoxide concentrations in the exposure chamber. The equation was also successfully used to predict carbon monoxide concentrations when the smoking rate and occupancy levels, as well as the room ventilation rate and mixing factor, were known. Carbon monoxide from cigarette and cigar smoking does not appear to present an inhalation hazard to nonsmokers, but suspended particulate matter may reach excessive concentrations. (Author abstract modified)

23511 APTIC NO. 42795

Callaghan, D. J. and M. Feldstein

MEETING AIR QUALITY STANDARDS, THE PRAGMATIC APPROACH. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1280-1283. 4 refs. (Dec. 6-11, Paper AD 36H.)*

The impact of air quality standards for suspended particulate matter and sulfur oxides on the San Francisco Bay Area Air Pollution Control District and its regulations limiting emissions of these pollutants from stationary sources are discussed. Since 1960, particulate emission limitations in the District consisted of a Ringelmann 2 or equivalent obscuration smoke opacity requirement, a grain loading emission limitation on incinerators of 0.2 grains/ cu ft and 0.3 grains on general operations, a process weight limitation, and a 2000 ppm sulfur dioxide emission maximum, with provision for exceeding this limit if ground level concentrations did not exceed certain prescribed values for specific durations of time. Data for suspended particulates and SO2 in 1969 indicate that air quality measurements for suspended particulate matter range from a low of 40 micrograms/cu m to a high of 84 micrograms/ cu m, with a District-wide average of 68 micrograms/cu m. Measurements of SO2 show a range of 3 to 19 micrograms/cu m annual geometric mean concentrations, with a maximum 24-hr value of 372 micrograms/ cu m or 0.15 ppm. A simplified box model with one half day residence time for emitted particulates, including an estimate of background loading of suspended particulates, had yielded information indicating a required reduction of 20 tons/day to meet an annual geometric mean of 60 micrograms/cu m. Similarly, emission limitations for SO2 have been calculated to meet air quality standards of 0.04 ppm averaged over 24 hours and 0.5 ppm averaged over one hour.

23512 APTIC NO. 43136

Deleanu, M.

IONIZATION AS AN INDEX OF THE EXTENT OF AIR POLLUTION AND THE DISTRIBUTION OF INDUSTRIAL CENTERS. *(Ionizatsiya kak pokazatel intensivnosti zagryazneniya atmosfernogo vozdukha i zonirovaniya promyshlennykh tsentrov). Text in Russian. Gigiena i Sanit., no. 10:42-46, 1960, 11 refs.*

Atmospheric ionization measurements were carried out at different distances from industrial emission sources to evaluate the pollution level. Unipolarity coefficients, ion coefficients of the pollution ratio of large to small ions), and relative ionic densities showing the ratio of the amount of positive and negative ions in highly polluted zones to that in a control zone at a distance of 1500-3000 m of the emission source were calculated. The concentration and the relative density of small ions increased with increasing distance of the emission source, while the concentration and relative density of large ions decreased. The ion coefficient of the pollution as well as the unipolarity coefficient of small ions usually decreased with the distance. It was possible to evaluate the pollution level and to distinguish different pollution zones in a radius of 300-4000 m around emissions sources in cities in industrial areas from the above ionization parameters. The above indices which are often superior in their relevancy to other indices such as sulfur dioxide, dust or radiation, can be applied for zoning industrial sites.

23513 APTIC NO. 42448

Dolling, B. and N. Walde

MEASUREMENTS OF THE CARBON MONOXIDE AND DUST CONCENTRATIONS AT THE INTERSECTION OF KUNGSGATAN (STREET) AND REGERINGSGATSBRON (REGERINGSGATA BRIDGE) IN STOCKHOLM FROM DEC. 19, 1968 THROUGH JAN. 15, 1969. *(Matning av koloxid- och stofthalten pa Kung-*

sga tan vid Regeringsgatsbron i Stockholm under tiden 19.12.1968 a 15.1.1969). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-35, 15p., June 4, 1969.

Results of carbon monoxide and dust concentration measurements, carried out at the intersection of Kungsgatan and Regeringsgatsbron in Stockholm, are presented. The 30-min CO-values were processed by a computer. The CO concentrations, though not as high as during the Aug.-Sept. 1968 measurement period, showed largely the same daily variations. The minimum and maximum daily averages were 5.6 and 11.8 ppm, and a highest 30-min mean of 36.7 ppm was measured between 12.00 and 12.29 pm. As opposed to findings at other monitoring stations, the elevated concentrations as observed during and following the afternoon rush hours persisted until about midnight. Cumulative frequencies of 50, 75, and 99 percentile for 9.1, 17.1, and 20.3 ppm, respectively, were determined. The corresponding values for the dust concentrations were 0.215, 0.305, and 0.685 mg/cu m. The dust concentrations, showing daily minimum and maximum of 0.17 and 0.61 mg/cu m, were higher than during the previous test period. The high values, observed between 8.00 pm and 10.00 pm, were accompanied by a corresponding increase in the CO level. The exceptionally high values of 0.34-0.61 mg/cu m, persisting over three consecutive days, were due to strong winds carrying dust from the Ukraine.

23514 APTIC NO. 42960

Dolling, B. and N. Walde

MEASUREMENTS OF THE CARBON MONOXIDE AND DUST CONCENTRATIONS AT BIRGER JARLSGATAN 15 (15 BIRGER JARLSGATAN - STREET) IN STOCKHOLM FROM MARCH 13 THROUGH APRIL 9, 1968. *(Matning av koloxid- och stofthalten vid Birger Jarlsgatan 15, Stockholm, under tiden 13.3. - 9.4.1968). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-19, 15p., Aug. 2, 1968.*

Results of carbon monoxide and dust concentration measurements, carried out at the street of Birger Jarlsgatan 15 in Stockholm are presented. The dust concentration measurements were performed over 1-hour, and in a few cases over 3-hour, periods at constant sampling rate by means of a fully automatic Staubmonitor FH 62 A type instrument applying a glass-fiber filter and krypton-85 isotope in an amount corresponding to 50 mCi. The variations of the 30-minute CO and hourly dust concentrations showed good correlation, while the daily variations displayed certain divergences. Both the CO concentrations and their cumulative frequencies were in good accordance with measurements obtained during measurements in the previous Nov.-Dec. period. A cumulative frequency of 50% for 5.6 ppm of CO and a maximum 30-minute mean of 21.3 ppm were determined. The dust concentrations were relatively high with minimum and maximum daily averages of 0.09[illegible] and 0.386 mg/cu m. A cumulative frequency of 50% for 0.20 mg/cu m was determined.

23515 APTIC NO. 42963

Dolling, B. and N. Walde

MEASUREMENTS OF CARBON MONOXIDE CONCENTRATIONS AT BIRGER JARLSGATAN 15 (15 BIRGER JARLSGATAN) IN STOCKHOLM FROM NOV. 22 THROUGH DEC. 7, 1967. *(Matning av koloxidhalten vid Birger Jarlsgatan 15, Stockholm, under tiden 22.11. - 7.12.1967). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-18, 11p., May 9, 1968.*

Results of carbon monoxide measurements carried out by means of two different instruments at Birger Jarlsgatan 15, a street in Stockholm, are presented. The immediate area of the laboratory van was free of any obstruction in the form of intersection or traffic lights. While good proportionality of the readings of the UNOR and URAS type instruments was observed, the latter delivered consequently higher values due to its sensibility to humidity, and the divergences were particularly considerable at low concentrations. The highest 30-minute mean was 12.3 ppm, and a cumulative frequency of 50% for 6.1 ppm was determined.

23516 APTIC NO. 43158

Feher, Viola

THE AIR POLLUTION CONDITIONS IN BUDAPEST AS DETERMINED FROM DUST DEPOSIT AND TOTAL SULFUR MEASUREMENTS PERFORMED BY THE BUDAPEST PUBLIC HEALTH AND EPIDEMIOLOGICAL STATION IN THE CAPITAL CITY DURING THE 1963-1968 PERIOD. *(Budapest levegoszennyezettsegenek kepe a Fovarosi KOJAL 1963-1968. evek kozott vegzett ulepedo por es osszken meresei alapjan). Text in Hungarian. Budapesti Kozegeszsegugy, 2(1):18-23, 1970.*

Results of dust deposit and total sulfur measurements, performed at 49 sampling stations at 1.50 m height during 1963-1968, are presented and compared with data from previous measurements. Organic and inorganic components of the dust deposits were determined by gravimetric and conductivity methods, while total sulfur was determined by the Liesegang method. With regard to a hygienic standard of 12.5 g/sq m/month for dust deposits, Budapest city air cannot be regarded as dust-polluted since the average deposit is 10.88 g/sq m/month. The above value was exceeded at 14 of the 49 stations, mainly in the neighborhood of railroad stations and industrial plants. A comparison of 1963-1964 values with 1967-1968 values showed, however, an increase of 5.65% for the five-year period. The dust deposit values increased at 31, stagnated at six, and decreased at 12 stations. A comparison with the 1956-1960 period revealed an over-all decrease of 7.8%. Very high total sulfur values, averaging 15.64 mg/100 hrs compared to a hygienic standard of 10 mg/100 hours, were measured. Values below the above standard were obtained at eight stations in summer and at only one during winter, which indicates the predominant contribution of heating. Increases at 34 stations, stagnation at seven and decreases at eight sampling stations was observed. The rate of increase for the five-year period considered was 16%, but a comparison with the previous 1956-1960 period showed an over-all decrease of 17.1%.

23517 APTIC NO. 42371

Frankenberg, T. T., I. A. Singer, and M. E. Smith

SULFUR DIOXIDE IN THE VICINITY OF THE CARDINAL PLANT OF THE AMERICAN ELECTRIC POWER SYSTEM. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1042-1049. 4 refs. (Dec. 6-11, Paper ME 14C.)*

The Cardinal Plant, which is operated by the Ohio Power Company on the west bank of the Ohio River approximately 10 miles south of Steubenville and 15 miles north of Wheeling, consists of two 600 MW supercritical steam boilers and their turbine generators. At the time when Cardinal was being designed, there were many questions about the performance of high stacks, and many speculations about their effectiveness in reducing ground level concentrations. Diffusion calculations were utilized as a means of determining the most appropriate heights for these stacks. A pollution study was made to determine the actual ground level concentrations of sulfur dioxide downwind from a major generating facility, to compare the predicted and observed concentrations at ground level, and to develop a system for obtaining and processing reliable field data. The essential plan of the study was to establish a network of sulfur dioxide monitoring stations and the necessary meteorological sensors to define the existing distributions for a complete year before any of the Cardinal facilities were in operation. Data sources, meteorology, sulfur dioxide levels, and Cardinal contributions are discussed. Hourly, monthly, and daily data are given.

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23518 APTIC NO. 42367

Fujiwara, Masahiro

THE STATE OF AIR POLLUTION BY HEAVY METALS AND ITS REGULATION. *(Jukinzoku ni yoru taiki osen no jittai to sono kisei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 8(6):510-522, June 1972. 24 refs.*

The highest, average, and lowest daily concentrations of metal pollutants in the air, measured in 1970 twice a month at 11 major cities in Japan, are tabulated. The average concentrations of cadmium ranges from 0.002 to 0.030 micrograms/cu m, lead 0.06 to 1.46 micrograms/cu m, zinc 0.3 to 2.0 micrograns/cu m, cobalt 0.00 to 0.00 micrograms/cu m, copper 0.04 to 0.51 micrograms/cu m, iron 0.7 to 15.5 micrograms/cu m, manganese 0.02 to 0.43 micrograms/cu m, nickel 0.019 to 0.149 micrograms/cu m, tin 0.0 to 0.1 micrograms/cu m. and vanadium 0.014 to 0.269 micrograms/cu m. The measurement results at many special areas of several major cities are also shown. In the air pollution control regulations, metals, such as cadmium and lead, are listed as harmful substances. The national standard for cadmium and cadmium compound concentrations is 1.0 mg/N cu m from all kinds of furnaces and facilities. That for lead and lead compound concentrations ranges from 10 mg/N cu m to 30 mg/N cu m depending on the sources.

23519 APTIC NO. 43379

Galbally, Ian E. and Helen S. Goodman

A STUDY OF THREE TRACE SUBSTANCES IN AN URBAN ATMOSPHERE. *Atmos. Environ., 6(6):409-417, June 1972. 10 refs.*

On 19 days during February and March, 1970, measurements were made of ozone, natural reactivity, and atmospheric dust in the near surface air at Aspendale, Australia. The three substances are highly correlated with each other and with air temperature. All show high concentrations when the wind is from land and low concentrations for off-water trajectories. Low concentrations are also measured on days of rainfall. It appears that air temperature is a sufficient measure of air mass origin or modification by rainfall to cause the correlations seen. The observations suggest that the dust concentrations completely adjust to the appropriate value for the underlying water surface in 4-8 hr. The results for bismuth-214 and ozone are too scattered to draw any such conclusions. (Author abstract modified)

23520 APTIC NO. 43170

Garber, K.

AIR POLLUTION IN THE INDUSTRIAL SECTION OF HAMBURG AND ITS EFFECT ON VEGETATION. *(Die Luftverunreinigung im Hamburger Industriegebiet und ihre Auswiskung auf die Vegetation). Jahresber. Staatinst. Angeu. Bot., Hamburg, vol. 83/84:158-173, 1966. 19 refs. Translated from German, 26p.*

Three-year tests were conducted in the industrial section of Hamburg to ascertain the amount of atmospheric pollutants and their effect on vegetation. In addition, the results from other institutes were evaluated. The highest sulfur dioxide average values were .4-.5 mg SO2/cu m from a SW and WSW direction. The effect of emissions on vegetation was determined by means of plant tests in containers with uniform soil compared to control tests in nonindustrial areas. Chemical analyses showed test plants in industrial areas had sulfate contents 10 times as high as in nonindustrial areas while chloride and fluorine contents were only twice or three times as high. (Author abstract modified)

23521 APTIC NO. 42354

Garcia-Fernandez, J. C., M. A. Guatelli, O. E. Roses, and C. M. Patino

SULFUR COMPOUNDS AS AIR POLLUTANTS IN THE RIACHUELO AREA--BUENOS AIRES. *International Union of Air POllution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 9-13. 11 refs. (Dec. 6-11, Paper SU 6F.)*

The industrial nature of the Riachuello area of Buenos Aires makes it important to develop an understanding of the amounts of pollutants present in the air. Sulfur dioxide was chosen as one of the initial pollutants to be studied because of its capacity to participate in the dynamic atmospheric chemistry, reacting photochemically or catalytically with other compounds to produce a higher oxidized compound. The SO2 is also frequently identified and determined in industrial or domestic atmospheres and, in the presence of humidity, it has a corrosive action on metals and other materials. The analysis of sulfur compounds was carried out by determinations of sulfation activity, spectrometric determinations of SO2, and iodometric determinations of hydrogen sulfide. In order to establish a relation between climatic conditions and air pollution, atmospheric pressure, intensity and direction of winds, relative humidity, and monthly rainfalls were recorded. Records of thermal inversions were also considered. During 11 of the 12 months studied, monthly averages of sulfation activity in the Riachuelo area were higher than values obtained at nine stations located within the city of Buenos Aires. Maximums obtained in the Riachuelo area correspond to November and December, while the ones obtained in Buenos Aires were produced during August. On the other hand, SO2 determinations did not reveal any differences between the two areas. Factors which might influence air pollution concentrations in the Riachuelo area are considered, as well as processes which might cause the increase in odors which takes place in the months with higher temperatures.

23522 APTIC NO. 43690

Gaudilliere, Remi

OPERATION UNDERGROUND FACILITIES AND THEIR VICINITY. *(Operation Ouvrages souterrains et leurs abords). Text in French. In: Etudes de Pollution Atmospherique a Paris et dans les Departements Peripheriques en 1970. Prefecture de Police, Paris (France), Lab. Central, p. III-3 to III-21, April, 1971.*

Results of continuous carbon monoxide concentration measurements, performed in underground garages, tunnels and their vicinity in 1970 are presented. The 10-minute means obtained for 16 different levels of six underground parking garages were almost always below a hygienic standard of 100 ppm at seven points, while the values for the rest were very often higher than the above limit. The percentage of 8-hour periods (between 8 am and 4 pm and between 12 am and 8 pm) where a 50 ppm-limit was exceeded ranged from zero to 100%. Thirty-minute means for six sampling points in the vicinity of underground parkings were usually low with a maximum of about 5.5 ppm, and values up to 10 ppm for one point were sometimes obtained. While no increased concentrations in parking exits and entrances were measured, relatively high concentrations with a maximum of 24 ppm at ventilation outlets were found. Concentration measurements on two days at the ventilation outlet of a tunnel and at a nearby building presented means of 46.2 ppm and 17.8 ppm, the lower figure being related to the building.

23523 APTIC NO. 43696

Gaudilliere, Remi and Michel Drouvin

OPERATION INDOOR POLLUTION IN DWELLING AND OTHER OCCUPIED SPACES. *(Operation Pollution interieure des locaux d habitation et autres lieux susceptibles d etre occupes). Text in French. In: Etudes de Pollution Atmospherique a Paris et dans les Departements*

Peripheriques en 1970. Prefecture de Police, Paris (France), Lab. Central, p. IX-3 to IX-8, April 1971.

Investigations of indoor pollution in dwellings and in and around industrial and business premises, performed by the Paris Police Headquarters Central Laboratory in Paris in 1970 are reviewed. Poisonings due to formaldehyde, Javel water, and nitric acid occurred in industrial premises. Nuisances due to perchloroethylene, trichloroethylene, ethylacrylate, ethylhydroxo benzoate, hydrogen sulfide, and nitrogen oxides near industrial and business premises were reported. Indoor pollution in dwelling and business premises was most ofter due to heating equipment. Outdoor pollution was caused by gas leakage, auromotive exhaust, careless use of chemicals and solvents, putrification, and discharged wastes releasing toxic gases or vapors. Cases of serious intoxication in dwellings were mostly due to improper maintenance of heating equipment. A total of 6502 air samples were analyzed to detect emission sources. Most of the analyses were related with carbon monoxide, and the rest with such pollutants as hydrocarbons and their derivatives, ammonia, hydrogen sulfide, nitrogen oxides, hydrocyanic acid, formaldehyde, esters, and ketones, for example.

23524 APTIC NO. 43689

Geronimi, Jean-Luc and Jeanne Duffaud

OPERATION CARBON MONOXIDE. *(Operation monoxyde de carbone). Text in French. In: Etudes de Pollution Atmospherique a Paris et dans les Departements Peripheriques en 1970. Prefecture de Police, Paris (France), Lab. Central, p. II-3 to II-31, April 1971.*

Results of carbon monoxide concentration measurements, carried out by means of 10 automatic recording sampling stations in Paris in 1970 are presented, and compared to corresponding results obtained from instantaneous measurements. Both the hourly and 24-hour means were 4.1 ppm, while the 8-hour mean was at 5.0 ppm. The 40 ppm- limit was exceeded with a value of 44 ppm in only one case, accounting for 0.015% of all samplings. The CO concentrations were highest during the morning and afternoon rush hours, between 8 and 9 am and 6 and 8 pm, respectively. Decreased concentrations during weekends and holidays were measured. A comparison of the above with results from instantaneous measurements from which a yearly average of 15.2 ppm was obtained, shows that the latter are two to four times higher than automatically recorded 1-hour means. A correlation factor of 0.6 for the two sets of values was determined.

23525 APTIC NO. 43691

Geronimi, Jean-Luc and Jeanne Duffaud

OPERATION NITROGEN DIOXIDE. *(Operation Dioxyde d azote). Text in French. In: Etudes de Pollution Atmospherique a Paris et dans les Departements Peripheriques en 1970. Prefecture de Police, Paris (France), Lab. Central, p. IV-3 to IV-18, April 1971.*

Results of nitrogen dioxide concentration measurements, performed at a measuring station located on the outskirts of Paris in 1970 are presented. The yearly average of 30 micrograms/cu m, obtained from a total of 6421 hourly means, was not significantly lower than the 1969 average of 34.4 micrograms/cu m. A peak value of 100 micrograms/cu m was obtained, while the 100 micrograms/cu m limit was exceeded by 1.5% of all 1969 readings with a peak of 175 micrograms/cu m. Abut 50% of all readings lay between 20 and 40 micrograms/cu m, and a minimum of 2.2 micrograms/cu m between 4 and 6 am was obtained. The NO2 concentrations showed distinct diurnal and nocturnal variations with two maxima and two minima. The first maximum, being in direct relation with the traffic density, was found between 8 and 11 am, and the second between 4 and 9 pm. The first minimum between 3 and 6 am was more accentuated than the second one which later separated the two above maxima.

23526 APTIC NO. 43694

Heros, Marguerite and Rene Heros

OPERATION THE SEINE LOOP. *(Operation Boucle de la Seine). Text in French. In: Etudes de Pollution Atmospherique a Paris et dans les Departements Peripheriques en 1970. Prefecture de Police, Paris (France), Lab. Central, p. VII-3 to VII-29, April 1971.*

Results of dust deposit measurements and dust analyses, performed in the industrial Seine loop area, lying to the northwest of Paris, in 1970, are presented. Insoluble, soluble, ash, and benzo-3,4- pyrene components of dust as well as benzo-3,4-pyrene, sulfate, and other ions in precipitation were determined. The yearly average dust deposit with 825 g/100 sq m/mo was below the corresponding 1969 value of 886 g/100 sq m/mo but higher than in 1961, 1962, 1963 or 1967. The difference from the respective value for Paris was negligible. Values between zero and 500 g/sq m/mo accounted for 23.6%, such between 500 and 1000 g/100 sq m/mo for 50.3% and 18.2% of all readings were in a range of 1000-1500 g/100 sq m/mo. The variations in the total, soluble, and insoluble dust deposits were largely parallel, and the monthly averages were highest during February, April, June, and November. The average benzo-3,4-pyrene concentration, determined from 273 precipitation samples, was 5.8 mg/100 sq m/mo, decidedly higher than the corresponding values of 2.6 mg/100 sq m/mo in 1969 and 2.2 mg/100 sq m/mo in 1968. The maximum and minimum were 56.1 and 0.4 mg/100 sq m/mo. Values below 5 mg were found in 85% of all samples, The highest values were determined for October, November, and particularly December, while the minimum pertained to August. The benzo-3,4-pyrene concentratio in the insoluble dust component, 17.5 micrograms/g, was in good correlation with the benzo-3,4-pyrene content found in precipitation. The quantitative relationships between benzo-3,4- pyrene and other polycyclic hydrocarbons present in dust (benzo-8,9 fluoroanthene, perylene, and anthanthrene) were dependent on the nature of the emission source.

23527 APTIC NO. 43688

Heros, Rene and Jeanne Duffaud

OPERATION CARBON MONOXIDE. *(Operation monoxyde de carbone). Text in French. In: Etudes de Pollution Atmospherique a Paris et dans les Departements Peripheriques en 1970. Prefecture de Police, Paris (France), Lab. Central, p. I-3 to I-31, April 1971.*

Results of automobile-generated carbon monoxide measurements, carried out at 317 sampling stations in Paris in 1970 are presented. The yearly average obtained from a total of 15,216 measurements was 15.2 ppm, the lowest since 1960. A steady decrease has been observed since 1967 when a value of 25.9 ppm was obtained. The readings for 98.1% of all sampling stations were below the serious level, while the corresponding percentage for 1969 was 90.2%. The sampling stations where the highest levels were measured remained the same over the years. The means had Gaussian distribution, and 99.9% of all values lay below 300 ppm, and 95% were between 2 and 60 ppm. The concentrations were dependent on meteorological conditions, and directly proportional to the traffic density as well as inversely proportional to the wind speed. The CO concentrations measured in underground passages and tunnels showed a slight decrease compared to 1969 values with an average of 19.8 ppm. Data for nine successive years showed that the concentrations were directly proportional to the length of passages and tunnels.

23528 APTIC NO. 43693

Heros, Rene

OPERATION LEAD AND BENZO-3,4-PYRENE. *(Operation Plomb et benzo-3,4 pyrene). Text in French. In: Etudes de Pollution Atmospherique a Paris et les Departements Peripheriques en 1970. Prefecture de Police, Paris (France), Lab. Central, p. VI-3 to VI-4, April 1971.*

Results of lead and benzo-3,4-pyrene concentration measurements, performed in Paris in the period from April 14 through Nov. 20, 1970, are presented. The dust sampling was made by means of a High Volume Air Sampler placed at a distance of 6 m from a highway. The lead concentrations varied from 0.5 to 8.4 micrograms/cu m. The benzo-3,4-pyrene content in the dust samples was in a range of 0.3-16.8 nanograms/cu m. No correlation between lead or benzo-3,4- pyrene concentrations and traffic density could be secured due to the influence of meteorological factors.

23529 APTIC NO. 43154

Holtaway, James S.

DETERMINATION OF BACKGROUND LEVELS AND HEALTH HAZARDS IN PLANT ENVIRONMENTAL AIR CONTAMINATION. *Ind. Med. Surg., vol. 33:230-234, April 1964. 6 refs.*

A monitoring and air quality measurement system was established at a foundry manufacturing manganese steel castings to determine background levels of pollution and potential health hazards in the environmental plant conditions. An impinger, a hi-vol sampler, and an electrostatic precipitator were used to sample the air at locations determined by wind directions in the vicinity of the plant. Dust fall was also examined, and all stacks capable of contributing to the discharge of particulate matter and fumes were sampled under isokinetic conditions. Results of determination of particulate matter, iron, and manganese in the atmosphere are presented.

23530 APTIC NO. 42760

Katz, Morris

THE ATMOSPHERIC POLLUTION PROBLEM IN CANADA. *Chem. Can., 4(8):25-32, Aug. 1952. 67 refs.*

In Canada, as in other countries, huge economic losses have been sustained by the unrestricted emission of excessive smoke, toxic gases, and particulate effluents from combustion, metallurgical, and other industrial operations. In agricultural and forest areas, extensive damage has been caused by the liberation of excessive quantities of sulfur dioxide, fluorine compounds, arsenical dust, and other effluents. In urban areas, the economic effects are evident in accelerated corrosion of metals, deterioration of stonework and other building materials, plant and household equipment, soiling and injury to textiles and other fabrics, and excessive laundry bills. The Trial smelter case and a current problem of urban pollution involving industrial wastes and smoke from vessel traffic in the Detroit River area are discussed. Other problems considered involve the nickel smelting district of Sudbury and the gold mining and smelting district of Yellowknife. Urban air pollution, sulfur dioxide pollution, and the distribution of particulate contaminants are considered, including the effects of air pollution on vegetation and human health. High stacks and meteorologic control are mentioned, as well as the removal and recovery of effluents. Emission standards are discussed.

23531 APTIC NO. 43393

Mortstedt, S. -E., K. E. Egeback, N. Walde, and K. Bjorkqvist

MEASUREMENTS OF THE CARBON MONOXIDE CONTENT IN THE AIR IN CITY TRAFFIC IN STOCKHOLM AND GOTEBORG FROM MAY THROUGH JUNE, 1966. *(Matning av luftens halt av koloxid i stadstrafik i Stockholm och Goteborg, maj - juni 1966). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-13, 29p., Oct. 6, 1967. 14 refs.*

Carbon monoxide measurements and traffic studies were performed in the center cities of Stockholm and Goteborg to determine the effect of the actual traffic patterns on the CO levels. The bulk of the CO is emitted by gasoline engine vehicles, but the contributions by Diesel engines as well as combustion are not negligible either. The highest CO concentrations can be measured at a small height above the pavement. Data on traffic density, temperature, wind speed and direction, and barometric pressure for both Stockholm and Goteborg are given. The measurements in Stockholm were performed at three different points with smooth traffic and frequent congestion, respectively, at a height of 1.50 m. The respective approximative averages for the total test period of 10 days were 21, 16, and 14 ppm. The measurements, carried out at two different points in Goteborg, gave approximate averages of 12 and 18 ppm, and momentary values exceeding 200 ppm were measured on several occasions. The 30-minute means ranges from 30 to 62 ppm and from 18 to 68 ppm, respectively, while the corresponding one-hour averages lay in ranges of 28-51 ppm and 16-64 ppm. The above results indicate the negative effect of congestion, high traffic density, narrow streets, and low wind speed or calm. The concentration values obtained for Stockholm and Goteborg are comparable to those observed in other big cities of the world.

23532 APTIC NO. 42353

Nieto, A. E., C. Macchi, and A. R. Digiani

AIR POLLUTION LEVELS IN THE CITY OF LA PLATA. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1-3. 11 refs. (Dec. 6-11, Paper SU 6A.)*

Topographic and meteorologic characteristics, industrial activities, and atmospheric contamination are discussed for the city of La Plata, Argentina. Carbon monoxide and carbon dioxide, together with aerosols, are the most conspicuous polluting agents in La Plata. As compared with global median pollution, significant pollution levels have been observed in some sectors of the city. A blue mist can be observed in the most crowded traffic zones on many days in the late afternoon. Effluents from the oil refinery, metallurgical, and sulfuric acid industries situated windward of the city may contribute antagonistic, additive, or synergistic effects to those pollutants already identified. This complex situation has motivated the continuation of research on air pollution in La Plata.

23533 APTIC NO. 43468

Pierson, William R., Wanda Brachaczek, and Joseph T. Kummer

SEARCH FOR AIRBORNE PARTICULATE DEBRIS FROM RUBBER TIRES. *Am. Chem. Soc., Div. Fuel Chem., Preprints, 11(2):236-244, 1971. 13 refs.*

Air from the intake and exhaust areas of two motor vehicle tunnels was drawn through 47 mm cellulose triacetate filters weighing 50 mg and having 0.2 micron mean pore diameter. Samples were collected over intervals ranging from a few hr to a few days. These samples, weighing several mg, were analyzed for styrene butadiene rubber, zinc, bromine, and lead. Analysis for SBR was performed by infrared absorption spectroscopy. The samples were refluxed in benzene, centrifuged, and the solution in corporated into a potassium bromide pellet for standard infrared analysis. Zinc was determined by neutron activation, atomic absorption, and anodic stripping voltammetry. Bromine was determined by neutron activation; and lead was determined by atomic absorption and anodic stripping voltammetry. Intake samples were too small to obtain their infrared spectra. At most, there are less than 40% as much particulates from tire wear as from exhaust. Lead ranges from 2 to 10% of the particulate matter added to the air during passage through the tunnel. Tire wear conditions at the two tunnel sites are probably rather mild and more work will be necessary to justify dismissing tire particulates as a significant matter for concern.

23534 APTIC NO. 43326

Traynor A. T.

SURVEY IN SELNEC. *Clean Air, 1(6):10, Summer 1972.*

A survey was carried out among the member Authorities of the South East Lancashire and North Cheshire Consultative Committee for the Investigation of Atmospheric Pollution and Noise with regard to the effects on smoke and sulfur dioxide levels of a suspension of smoke control orders. Old age pensioners readily went over to coal in many areas because of the saving in cost. The only publicly expressed opinion on suspension was that it was a bad thing. People regretted the reappearance of smoke and soot -- particularly visible on paintwork, washing, and motor cars. Most areas showed decreases in emissions levels in spite of the suspension of the smoke control orders.

23535 APTIC NO. 43442

Vilain, N.

AIR POLLUTION. INQUIRY PERFORMED IN GRENOBLE. *(La pollution atmospherique. Enquete a Grenoble de 1966 a 1968). Text in French. Grenoble Univ. (France), Dept. of Pharmacy, Thesis (Ph.D.), 1970, 122p. 124 refs.*

General aspects of air pollution are outlined, and an inquiry of the air pollution in and around Grenoble is presented. The chief sources of air pollution such as industry, domestic heating, and traffic, as well as the basic pollutants (dust, toxic vapors, gases, carbon monoxide, carbon dioxide, sulfur dioxide, volatile hydrocarbons, and smog) are reviewed. Meteorological and climatic influences are outlined special regard to temperature inversion. A description of pollution catastrophes (Meuse valley, Donora, Pa., London, and Lyon) is followed by a review of the effects of air pollution on man and animals (chronic bronchitis, microbial infections, asthma, lung cancer, and mucous lesions), plants, with special regard to SO2 and fluorine compounds, as well as on buildings and materials. Basic methods and possibilities of eliminating or abating air pollution as caused by industry, domestic heating, and traffic by means of adequate technical measures and the legislative aspects of the war on air pollution are outlined. An inquiry, performed in Grenoble in the period from May 1966 to June 1968 is described. The geographic and economic situation and the meteorological conditions characteristic of the Grenoble region are described. While all possible sources of pollution were covered by the systematic survey, the investigations centered on SO2 and smoke emissions. The results obtained for Grenoble city and its neighborhood proved unambigously the effects of industry, domestic heating, and traffic on the evolution of the air pollution. Suburbs were less polluted than the city and points with heavy traffic, and the pollution index on Sundays and holidays was lower than on workdays. Abatement of the air pollution due to precipitation and wind was observed in about 80% of all cases.

23536 APTIC NO. 42742

Volchok, H. L. and B. Krajewski

RADIONUCLIDES AND LEAD IN SURFACE AIR. *In: Health and Safety Laboratory Fallout Program. Quarterly Summary Report. Appendix. Atomic Energy Commission, New York, Health and Safety Lab., C-1 to C-9, C-97 to C-102, April 1, 1972. 4 refs.*

NTIS: HASL-249

A surface air sampling program was initiated in January 1963 to study the spatial and temporal distribution of nuclear weapons debris and lead in the surface air. Initially, sites had been grouped roughly along the 80th meridian (west); subsequently, a number of other sites were added to investigate the possible effects of longitude, elevation, and proximity to coast lines. From late 1965 through March 1969, samplers were placed on four Atlantic Ocean weather ships to extend the surface air study over the marine environment. The present network extends from about 81 deg north to 90 deg south. For the routine program approximately 1400 cu m/day ambient air are drawn through a 20 cm diameter Microsorban filter for the land stations. At the ocean stations, about 2200 cu m/day of air are filtered by 20 by 25 cm Microsorban filters. Each sample is split into equal aliquots, one for gamma counting and spectrometry and the other for radiochemistry. The gamma activity of half of the monthly composites are obtained with an 8-inch by 4-inch sodium iodide crystal. Gamma spectra of the monthly composites are obtained using a lithium-drifted germanium diode system. Since there were no major weapon test series from the end of 1962 until May 1966, only the longer-lived artificially produced radionuclides were present in the filters collected during this period. In samples collected after French or Chinese atmospheric weapons tests additional short-lived nuclides were analyzed. In response to the growing concern over air pollution and in particular to the known hazard linked to stable lead, analysis for this element was added to the program. Activity concentrations for the radionuclide, gross gamma, and stable lead analyses are reported in tabular form.

23537 APTIC NO. 43388

Volchok, H. L. and B. Krajewski

RADIONUCLIDES AND LEAD IN SURFACE AIR. *In: Appendix to Health and Safety Laboratory Fallout Program. Quarterly Summary Report. March 1, 1972 through June 1, 1972. Atomic Energy Commission, New York, Health and Safety Lab., p. C-1 to C-9, C-102 to C-107, 1972. 4 refs.*

A program to study the spatial and temporal distribution of nuclear weapons debris and lead in the surface air is reviewed. Sampling sites along with their coordinates and elevations are listed. Gamma analysis was made of one-half of the monthly composites using a lithium-drifted germanium diode (GeLi) system. Concentrations of the nuclides were determined by computer resolution of the spectra. Radiochemical analysis was made of the second-half of the monthly composites. Only the longer-lived artificially produced radionuclides were collected in the filters and emphasis was given to the determination of manganese(-54), iron(-55), strontium(-89), strontium(-90), cadmium(-109), cesium(-134), cerium(-141), cerium (-144), plutonium(-238), plutonium(-239), and zirconium(-95). Stable lead analysis is reviewed. Quality control and sampling procedures are described. Data from all three analyses are given.

23538 APTIC NO. 43558

Volchok, H. L. and M. T. Kleinman

RADIONUCLIDES AND LEAD IN SURFACE AIR. *Atomic Energy Commission, New York, Health and Safety Lab. HASL Fallout Program Quarterly Summary Report, Sept. 1, 1971-Dec. 1, 1971, Appendix C, p. C1-C10, C97, C102, 1972. 4 refs.*

In 1963, a surface-air sampling program was initiated to study the spatial and temporal distribution of nuclear weapons debris and lead in surface air. Monthly composites collected at stations extending from about 81 deg North to 90 deg South are analyzed for gamma spectra, radionuclides, and stable lead. The activity concentrations for gamma analyses conducted in 1963 and for stable lead analyses from 1966 through 1971 are given. Radionuclides detectable between 1962 and 1966 are discussed.

ATMOSPHERIC INTERACTION

23539 APTIC NO. 42660

Japan Environmental Agency

THREE-DIMENSIONAL SURVEY ON ENVIRONMENTAL AIR POLLUTION DENSITY - SURVEY RESULTS SUMMARIZED. *(Kankyo nodo rittai chosa, Chosa kekka gaiyo). Text in Japanese. 39p., March 1972.*

The three-dimensional survey designed to determine concentrations and distribution of nitrogen dioxide, sulfur dioxide, and aerosol in the lower atmospheric strata over the Tokyo Bay and its neighboring areas was conducted from Jan. 27 through Feb. 8, 1972. The survey data together with those obtained at the existing air pollution observation facilities in Tokyo, Kanagawa, Chiba, and Saitama Prefectures were comprehensively analyzed to determine the distribution of the air pollutants over the areas in the winter season. This is a preliminary survey for the more comprehensive air pollution survey scheduled to take place in the coming summer. Using an airplane flying at altitudes of 1000 m, 500 m, and 300 m, air was sampled and measured by a correlation spectrometer and nephelometer. Wind in the higher strata was observed by means of balloons at five selected points in the area. The ground-level pollution was measured by the existing air pollution observation facilities in the Prefectures. The data thus obtained on NO2, nitric oxide, sulfur oxides, wind direction, and wind velocity were mapped in 24 diagrams. Based on the average of the measured values obtained from six measurements, the highest concentration of NO2 appeared over an area spanning the west coast district of Tokyo Bay to that south of the Bay. This is typical of the horizontal NO2 distribution in the winter when northern wind prevails. The horizontal distribution pattern of SO2 over the area was fragmentary, whereas that of NO2 was continuous. The aerosol distribution at 1000 m altitude showed some peaks when calm (1-6 m/ sec) but leveled off on a windy day (6-17 m/sec), the value being about 30 micrograms/cu m. Measured by altitude, most NO2 and SO2 existed below 500 m and hardly above that altitude. Aerosol showed an identical vertical distribution pattern at both 300 m and 500 m altitudes.

23540 APTIC NO. 42930

METEOROLOGY. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 12, p. 159-184. 50 refs.*

Air pollution in a community, apart from the background pollution level of incoming air masses, is a function of community activities and of weather conditions, both of which are functions of time. For example, automobile traffic in cities has a marked diurnal variation, while domestic heating has an annual variation in addition to a diurnal variation. The diurnal and annual variations of certain weather elements such as wind speed and temperature lapse rate are no less important in the consideration of air pollution problems. Both community activities and weather conditions are also functions of location. Winds, temperature lapse rate, and precipitation are considered, as well as temperature, water vapor, fog, visibility, ground state, clouds, and radiation. Plume behavior, transport, effects of underlying surface, mixing processes and turbulence, wind and temperature profiles, dispersion, and related weather conditions are discussed. The application of diffusion formulas to air pollution problems is considered.

23541 APTIC NO. 43321

Tokyo Metropolitan Environmental Protection Research Inst. (Japan), Atmosphere Div.

AN INTERIM REPORT OF THE MEETING FOR RESEARCH CONCERNING THE FORMATION MECHANISM OF TOKYO SMOG AND ITS ADVERSE EFFECTS ON PLANTS. *(Tokyo-Smog no seiseikijo shokubutsuhigai ni kansuru chosakenkyubukai chukan hokoku). Text in Japanese. 491p., March 1972.*

The relationship between pollution and atmospheric conditions, measurement methods, analysis of the results of field studies, the occurrence of high level oxidants during the night, adverse effects on plants, and sources of pollution are discussed. There were 47 days when the oxidant levels showed more than 0.15 ppm on an hourly average from May to Dec. 1971. About 71% of the highly polluted areas are concentrated in the districts located 5 to 20 km from the seaside of Tokyo Bay. The oxidant level peaked at 12 to 2 o clock, and time difference of 2 to 5 hours was observed in peaks between the inland and seaside areas. In the summer season, the oxidant levels at an altitude of 300 to 500 m were above those at the surface of the earth. The oxidant levels were higher in inland areas. A close relationship was observed between oxidant levels, sulfur dioxide, nitrogen dioxide, and airborne dust. The smog was formed more frequently during changeable conditions of alternating clear and cloudy weather with 4 to 5 m/sec wind velocity. Measurements of peroxyacetyl nitrate, ozones by the ethylene method, nitrogen oxides, sulfuric acid, nitric acid, and ultraviolet rays were made. Most of the oxidants were ozone, and PAN was also detected during the summer. Automobile exhaust gases had patterns resembling those of hydrocarbons. The equation for correcting oxidant level during night smog was given for continuous measurement results, after due consideration of the effects of nitric oxide and NO2. Abnormalities were seen in zelkova trees, Carolina poplars, plane trees, and ginkgo trees in all the ward districts. Vegetables were affected in part of the metropolitan areas adjacent to ward districts. Pollutant emissions from automobiles were affected by driving conditions.

23542 APTIC NO. 42609

Abe, Shigeo

ON THE STABILITY OF ATMOSPHERIC MOTION SYSTEM HEATED FROM BELOW: PART 2. SOME APPLICATIONS TO ATMOSPHERIC MOTION SYSTEMS. *Mem. Def. Acad. Japan, 11(3):243-271, 1971. 59 refs.*

An idealized motion system of atmospheric air heated from below is considered. Heating and frictional dissipation are considered to balance approximately when the motion system is steady, so that the potential temperature ought to increase upward due to increase of inertial overweight in the upper layer. The important factor in the acceleration of circulation in an air mass is vertical stability, which is an especially crucial factor in a strong rotating wind system such as a typhoon. A tendency of division of the circulation area, which appears in the case of small width height ratio as an effect of curvature of the stream line, is an important point in understanding the structure of typhoons. Factors and equations involved in the following atmospheric phenomenon are discussed: oscillating phenomena in the atmosphere, small-scale convection in an air mass, ascending motion and development of a typhoon area, and vertical flow in the meridional plane.

23543 APTIC NO. 42783

Abe, Shigeo

ON THE STABILITY OF ATMOSPHERIC MOTION SYSTEMS HEATED FROM BELOW: PART I. *Mem. Def. Acad. Japan, 11(2):115-135, 1971.*

Much importance must be laid on large scale atmospheric circulation due to inertia forces. The thermal influence affecting an atmospheric motion system is considered by the following simplification: namely, a thermally and dynamically neutral motion system, assumed as a basic state, is thought to be laid under disturbances. The stability of such a disturbed motion, which is brought about by thermal and dynamical impulses initially given by changes of potential temperature and wind velocity, respectively, is examined. The direction of the generated circulation is determined by the vorticity equation related to meridional flow in the case of zonal basic motion. An equation for the stability of such a disturbed motion is also presented. The vertical wind shear and negative heating from below contribute to instabilizing, and the absolute vorticity contributes to stabilizing, the disturbance. The width-height ratio accompanied by absolute vorticity also plays a part in stability determination. An equilibrium state of motion, influenced by thermal and dynamic effects, can exist aside from the neutral state.

23544 APTIC NO. 42443

Alkezweeny, A. J. and W. D. Green

THE CONTRIBUTION OF AIR POLLUTION TO THE CONCENTRATION OF CONDENSATION AND ICE NUCLEI. *Preprint, American Meteorological Society, Boston, Mass., 9p., 1971. (Presented at the American Meteorological Society, Meeting, 51st, San Francisco, Calif., Jan. 11-14, 1971.)*

One aspect of potential weather modification by growing concentrations of air pollutants that has received little attention is the possible change in concentration of the fundamental particles which serve as ice and cloud particle condensation centers. The concentration of cloud condensation nuclei determines the number and size of droplets in a cloud. These factors can influence the rate of coalescence into larger rain droplets. Ice nuclei initiate the formation of larger ice crystals that eventually fall as snow or rain. Three separate surveys were conducted in 1969 of ice and cloud condensation in nuclei in the Los Angeles area. While pollution in the Los Angeles basin does produce cloud condensation nuclei, photochemical or secondary aerosols do not appear to be as effective nuclei as particles produced by primary mechanisms such as combustion. With the exception of one observation, downwind of a steel foundry, pollution in Los Angeles does not appear to be a source of ice nuclei.

23545 APTIC NO. 43452

Benarie, M., A. Nonat, and T. Menard

A STUDY OF SULFUR DIOXIDE CONVERSION INTO SULFURIC ACID AS AFFECTED BY THE CLIMATIC CONDITIONS OF AN INDUSTRIAL URBAN AREA (ROUEN). *(Etude de la transformation de l anhydride sulfureux en acide sulfurique en relation ave les donnees climatologiques, dans un ensemble urbain a caractere industriel (Rouen)). Text in French. Inst National de Recherche Chimique Appliquee, Vert-le-Petit (France), Service Pollution Atmospherique Contract 69.01.891, Rept. B. MB/mg 230, p. 1-34, Oct 1971. 38 refs.*

The conversion of sulfur dioxide into sulfuric acid as affected by meteorological and other factors was studied in the industrial urban area Rouen in the Nov. 1969 April 1970 period. The aerosol samples collected at seven stations at a rate of 2 cu m/24 hr were analyzed for H2SO4 by means of a specific method using microdiffusion and nephelometric sulfate ion determination with barium. The SO2 concentrations were in a range of 68-242 micrograms/cu m, while the H2SO4 concentrations varied from 4.7 to 8.8 micrograms/cu m. An average of 7.1% of the total sulfur was in the form of H2SO4 in winter. The H2SO4 content accounted for 50-70% of the water-soluble sulfates present in the air. The number of days with acid pollution (H2SO4 above 4%) was highest in December due to both low wind speeds and temperatures. As the proportion of H2SO4 decreased with wind speed the conversion was time-dependent. The catalytic effect of solid aerosol particles on the conversion was dominant, while the affect of ammonia was but slight, and that of nitrogen dioxide negligible. Fog, having more powerful washout than catalytic effect, reduced the H2SO4 concentration. No photochemical reactions could be evidenced. The conversion rate of SO2 to H2SO4, estimated for 24-hour averages, was between 6 and 25%/hr. The results are in good accordance with other studies.

23546 APTIC NO. 42793

Berlyand, M. E.

INVESTIGATIONS OF ATMOSPHERIC DIFFUSION PROVIDING A METEOROLOGICAL BASIS FOR AIR POLLUTION CONTROL. *Atmos. Environ., vol. 6:379-388, June 6, 1972. 4 refs. (Presented at the IUGG-IAMAP, General Assembly, 15th, Moscow, USSR, Aug., 1971.)*

Investigations of atmospheric diffusion and applicable measurement methods are reported. The Gaussian and the K-theory diffusion models were used to calculate the concentration field around a source. With the K-theory model, pollutant distributions may be studied from different kinds of sources under various boundary conditions and environmental characteristics. The horizontal and vertical components of the wind and of the exchange coefficients were studied. Numerical methods of integration of the diffusion equation were developed which took into account the singularity near the emission source and the absence of an upper boundary. The method of difference factorization was effective in the studies. The vertical velocity field near the emission source was established by solving the system of motion and heat transfer equations with the equation of turbulent pollutant diffusion. An equation for determining emissions from multiple sources was developed. Abnormal meteorological conditions affecting ground level concentrations and diffusion over an uneven terrain in conditions of complex relief and in the presence of water basins were investigated. Experimental work included the study of the wind profile dependence on geometric parameters of a hill and a hollow.

23547 APTIC NO. 43259

Bolin, Bert

GLOBAL AND REGIONAL AIR POLLUTION PROBLEMS. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 1:35 to 1:47. (Sept. 1-6.)*

The role of the atmosphere for the dispersion of pollutants depends upon their residence times in the atmosphere and it may be very different for different compounds. The increase of carbon dioxide in the atmosphere can be observed both in the northern and southern hemispheres, in spite of the fact that more than 90% of all emissions take place in the northern hemisphere. Measurable amounts of DDT are found almost everywhere in animals in the oceans of the world. Apparently DDT has dispersed through considerable parts of the entire globe. Sulfur dioxide concentration in air decreases rather rapidly with increasing distance from the emission source. To a limited degree, this depends upon the disappearance of sulfur dioxide from the air, but is essentially due to mixing with air containing less sulfur. The probable residence time of sulfur in the atmosphere is 2 to 4 days. Within this amount of time, the vertical mixing in the atmosphere distributes sulfur only up to about two km elevation. To get an idea of the horizontal dispersion of the SO2 emissions, it is therefore appropriate to study wind conditions at a height of 1 to 2 km above the surface of the Earth. The dispersion of air pollution from a point in Central Europe computed on the basis of winds at 1.5 km elevation for 24 hr and 60 hr are shown. More than half of the dispersion is found outside a circle with a radius of about 600 km after 24 hr and 1300 km after 60 hr. The approximate deposition pattern of sulfuric acid over Western Europe is also presented.

23548 APTIC NO. 43205

Bowman, W. Alan and W. Gale Biggs

METEOROLOGICAL ASPECTS OF LARGE COOLING TOWERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1972. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-128.)*

As a means of assessing the impact of the operation of cooling towers at a site in Pennsylvania, a computer program was used to calculate plume lengths, contact of the tower plume with the ground, and occurrence of ground contact of the plume and temperatures below freezing. Results are presented in the form of cumulative frequency distributions of plume length, fogging, and icing. The model was validated for the mechanical draft tower under a variety of meteorological conditions and the results are encouraging. The mechanical draft and the natural draft evaporative type cooling towers were studied. Comparisons of the impact on the environment of each type were made. Calculations of plumes to distances of 10,000 ft were performed and tested for ground contact to determine fogging and compared simultaneously with temperature to determine icing conditions. Built into the computer model were considerations of local topography, physical characteristics of the towers, whether the source was one of many towers, a plume rise consideration, and several design characteristics for evaporative type cooling towers. Calculations were made using each 3-hour observation and then summarized in table and graphical form. (Author summary modified)

23549 APTIC NO. 43235

Bufalini, Joseph J., Bruce W. Gay, Jr., and Kenneth L. Brubaker

HYDROGEN PEROXIDE - ITS FORMATION FROM FORMALDEHYDE PHOTOOXIDATION AND PRESENCE IN URBAN ATMOSPHERES. *Preprint, American Chemical Society, Washington, D. C., 32p., 1971. 26 refs. (Presented at the American Chemical Society, National Meeting, 161st, Los Angeles, Calif., March 28-April 2, 1971.)*

Hydrogen peroxide has been observed in laboratory studies involving the photooxidation of formaldehyde and in urban atmospheres. In the laboratory studies, the H_2O_2 yield was nonlinear with formaldehyde consumption and decreased in the presence of nitrogen oxides. The atmosphere in the vicinity of the mobile instrument trailer in Hoboken, N. J. contained concentrations of up to 4 pphm H_2O_2. This concentration was measured on a day of high solar radiation and moderate smog formation. On days when solar radiation was low because of cloud cover, no H_2O_2 was observed. In August 1970, the atmosphere at Riverside, Calif. was sampled for H_2O_2 during days of photochemical smog formation. During a severe smog episode, oxidant concentrations as high as 0.65 ppm were observed. Hydrogen peroxide reached a maximum of 18 pphm during the episode. This maximum appeared when the total oxidant maximized.

23550 APTIC NO. 42606

Bullrich, K., G. Eschelbach, K. Fischer, and G. Haenel

NEW ASPECTS OF SCATTERING AND ABSORBING PROPERTIES OF ATMOSPHERIC AEROSOL PARTICLES. *J. Colloid Interface Sci., 39(3):546-550, June 1972. 7 refs.*

Knowledge of the scattering and absorbing processes of atmospheric aerosol particles in the solar wavelength is necessary to calculate the energy balance of the atmosphere. Both processes depend on the relative humidity of the air. The results of the scattering and absorbing properties of atmospheric aerosol particles enable one to calculate the desired upward and downward radiant fluxes in the atmosphere under various conditions. Displayed graphically, the ordinate shows the height, and the abscissa shows the upward and downward radiant fluxes from the sky for two cases. In the first case considered, the reflectivity of the earth surface was assumed to be 0.25. In the second case no reflectivity was taken into account. To obtain these curves, it was necessary to compute the radiances of the ascending and descending radiation for many grid points of the hemispheres above and below the point under consideration. The integration taken over all these values yields the total radiant flux as presented on the figure. The multiple scattering is included. These fluxes are among other necessary prerequisites for long-time weather prediction as well as for estimation of the influence of atmospheric particulate matter on climate.

23551 APTIC NO. 43391

Caretto, L. S.

PHOTOCHEMICAL SMOG. *Preprint, Northern California Committee for Environmental Information, Berkeley, Calif., 4p., March 1970.*

The term smog refers to the special form of air pollution first noticed in the Los Angeles Basin in the early 1940s. Smog is a product of chemical reactions in the sunlit atmosphere between reactive organic compounds, such as the aldehydes and certain hydrocarbons, and oxides of nitrogen. These compounds are emitted to the atmosphere by a variety of sources, the most prolific being the automobile. The internal combustion process produces nitric oxide which react with oxygen in the air to form nitrogen dioxide. The NO_2 decomposes in sunlight to produce ozone, one of the trademarks of photochemical smog. Other compounds, such as peroxyacetyl nitrate, react with reactive organics to produce eye irritants. The intensity of the smog varies with the time of day and the location, since several hours are necessary for the reaction to produce noticeable products. Control in the past of nonreactive pollutants such as carbon monoxide in auto exhaust have inadvertantly increased the smog potential by increasing the NO emissions. The standards of NO_x emission under California law are 4 gm/mi, 1.3 gm/mi, and 1.0 gm/mi for 1971, 1975, and 1976 respectively. Most studies on smog thus far have been conducted in smog chambers and though it is not yet possible to characterize smog completely, it appears possible to control it by controlling the emissions of hydrocarbons and NO_x.

23552 APTIC NO. 43516

Castellano, E. and H. J. Schumacher

KINETICS OF THE PHOTOCHEMICAL DECOMPOSITION OF OZONE DUE TO 313 MICRON-LIGHT. *(Die Kinetik des photochemischen Ozonzerfalles im Licht der Wellenlaenge 313 Micron). Text in Swedish. Z. Physik. Chem. Neue Folge (Frankfurt), 76(5/6):258-264, 1971. 11 refs.*

The photochemical decomposition of ozone in light of 3130 wavelength was studied and compared to results obtained for a wavelength of 2537. The primary process, yielding an 02 molecule and 0(2D) atom, was quantitative to a minimum degree of 90%. As the results obtained for 3130 and 2537 were identical with 95% accuracy, the reaction mechanisms can be regarded as being the same for both wavelengths. The collision of O_2 molecules, at 60% output, which were able to destroy one ozone molecule each. Formulae of the reaction rate and the quantum yield of the ozone decomposition and values of reaction constants are given.

23553 APTIC NO. 43208

Cermak, Jack E., Fazal H. Chaudhry, and Joseph A. Bagala

URBAN AND ARCHITECTURAL PLANNING FOR AIR POLLUTION CONTROL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., 1972. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-135.)*

The interactive effects of man-created urban geometry, natural topography, and individual building forms on the meteorological variables responsible for transport of air pollutants are too complex for representation by mathematical or numerical models. The urban air pollution problem is reviewed in the light of new trends in architecture. The basis, capabilities, and limitations for obtaining information by physical modeling in wind tunnels is discussed to help urban planners and architects reach sound decisions. Several actual studies are described to illustrate the use of wind tunnel techniques now available. These include a study to minimize transport of automobile exhausts from a parking garage into air conditioning intakes for a hospital facility by proper location of exhausts and intake ports. Another study reveals the effect of constructing a freeway through a complex urban area upon movement of air pollutants through the city. (Author abstract modified)

23554 *APTIC NO. 42373*

Chalker, W. R. and J. L. Parsons

AIR QUALITY MANAGEMENT OF INDUSTRIAL SITES. International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1063-1067. (Dec. 6-11, Paper ME 14F.)

The pollution dispersion model of du Pont de Nemours and Co. is described, including how it serves as one of the tools the company uses in air quality management at its industrial sites. The model is geared for providing answers to short-term concentrations and to prevent a short-term maximum concentration from being exceeded for the critical wind speed case. The Bosanquet-Pearson equation was chosen for validation of the model. For plume rise in calculating effective stack height, the Bryant Davidson equation for cool stack gases is utilized. The Holland equation with Stumke correction factor is used for hot stack gases up to 1000 million Btu/hr heat input, and the Lucus equation is used for greater heat inputs. The final equations are presented, as they establish the lb/hr that can be discharged from a stack of chosen parameters to prevent exceeding the 30-minute air quality goal chosen. Recognizing the time relationship between the 30-minute maximum and, for example, the 1-minute or 24-hour concentrations, these equations would have feasibility in establishing emission limits and stack parameters to meet other relatively short period air quality goals. The status of the du Pont dispersion and validation of the model for sulfur dioxide are discussed. The model was applied to several field studies.

23555 APTIC NO. 42871

Chu, Roland T. and Scott D. Thayer

SOME RESULTS OF NUMERICAL SIMULATION OF WARM FOG MODIFICATION WITH TURBULENT DIFFUSION AND HORIZONTAL WIND ADVECTION. *Preprint, American Meteorological Society, Boston, Mass., p. 228-235, 1972. 4 refs. (Presented at the International Conference on Aerospace and Aeronautical Meteorology, Washington, D. C., May 22-26, 1972.)*

A physical-numerical model in two space dimensions was developed to simulate the modification of warm fog through the seeding of hydroscopic particles under various initial and environmental conditions. The model equations describe the evaporation of fog droplets and the simultaneous condensation growth of seeding particles, and predict the resultant ambient humidity, liquid water content, visibility improvement, and spatial distribution of seeding particles in the seeded fog layer. Environmental effects such as turbulent diffusion, advection by horizontal wind, and wind shear were taken into consideration.

23556 APTIC NO. 43415

Coutant, R. W., E. L. Merryman, R. E. Barrett, R. D. Giammar, and A. Levy

A STUDY OF THE FATE OF SO2 IN FLUE GAS. *Battelle Memorial Inst., Columbus Ohio, Columbus Labs., Environmental Protection Agency Contract CPA 70-121, APTD-1107, 41p., March 31, 1972. 14 refs.*

NTIS: PB 209259

The Battelle Multifuel Furnace Facility was used to measure sulfur content and particulate matter of flue gas both in the stack section and with fixed wing aircraft. Sampling of plumes with fixed wing aircraft at distances of a mile or less from the source if difficult. The sulfur dioxide half-life is 1 to 6 hours. Humidity effects are insufficient to explain the loss of SO2 in plumes by oxidation. On the average, about 90% of the sulfur in coal or fuel oil can be expected to leave the stack as SO2. The percentage leaving the stack is only slightly affected by the nature of the fuel. The effect of relative humidity on the half-life of SO2 needs to be further clarified. The major source of decay was absorption of SO2 by fly ash.

23557 APTIC NO. 42741

Dangermond, Paul Jack

COMPUTER MAPPING AS AN AID IN AIR POLLUTION STUDIES. VOLUME II: INDIVIDUAL REPORTS. REPORT I. CALIFORNIA STUDY. *Harvard Univ., Cambridge, Mass., Graduate School of Design, National Air Pollution Control Administration Demonstration Grant 68A-2405D, Rept. APTD- 0784, 37p., April 1970. 12 refs.*

NTIS: PB 204194

Computer mapping and the air pollution problems of California include the counties of Los Angeles and San Bernardino, and the State of California. Monitoring networks and the use of permeable and impermeable barriers in mapping of pollution levels in mountain areas are discussed. The Los Angeles County study used data from an eleven-year investigation of carbon monoxide concentrations in the area. The major task of this section of the study was to represent adequately the influence of the mountain range in inhibiting the flow of pollutants from the valley to the desert. The San Bernardino study involved the mapping of values of total suspended dust concentrations. In the California study, a nine month time-series of oxidant concentration as distributed across the state was mapped and a single month examined on a geographical basis to see how the oxidant standard had been violated.

23558 APTIC NO. 43475

Deleanu, M. and E. Elges

OBSERVATIONS REGARDING AIR IONIZATION IN CLUJ COVERING A PERIOD OF 11 YEARS (1955-1965). *(Observatii ionizarea aeruliui la Cluj pe o perioada de 11 ani (1955-1965). Text in Rumanian. In: Culegere de lucrari. Inst. Meteorologic, Bucharest (Romania), p. 517-530, 1965. 22 refs.*

During 1955-1965, 2213 measurements were made by an Ebert counter of the negative and positive small ion concentration in a relatively uncontaminated area of the city of Cluj. Ten to 25 measurements were made each month. The arithmetic means and boundaries of small ion concentrations are presented as well as their monthly and annual development. From 1955 to 1957 the average air ionization did not show any important fluctuation and is used as a term of 100% reference. From 1957 to 1965, annual ionization increased to 114-148%. After a peak during 1958-1959 of 136-148%, ionization diminished moderately beginning in 1960 (120%), reaching the pre-1957 level in 1965. The average monthly increase ranged from 0-91%. The role played by artificial radioactivity on this increment is discussed. Data from the pre atomic age had shown the relative stability enjoyed by the ions in uncontaminated atmospheres as well as their decrease with increasing air pollution.

23559 APTIC NO. 42730

Eddy, Amos and William Parton

AN ATMOSPHERE-ORIENTED ECOSYSTEM SIMULATION MODEL. *Proc. Okla. Acad. Sci., vol. 50:145-150, 1970. 1 ref.*

A human urban-rural ecosystem was modelled numerically and run on a computer system. A decision making executive routine coordinates the interactions between five submodels. These second level subroutines comprise a statistical atmospheric model, a hydrology model, a city model, a biology model, and a botany model. The main characteristics and physical dimensions of the system, which has been simulated, are shown, and the manner in which the people in the city move in response to air pollution is indicated. Future development of the model is considered. (Author abstract modified)

23560 *APTIC NO. 43257*

Egan, Bruce A. and James R. Mahoney

A NUMERICAL MODEL OF URBAN AIR POLLUTION TRANSPORT. Preprint, American Meteorological Society, Boston, Mass. and Air Pollution Control Assoc., Pittsburgh, Pa., p. 8-13, 1971. 12 refs. (Presented at the Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-9, 1971.)

The ultimate usefulness of urban transport models depends on how realistically urban emissions and dispersion are treated in light of the uncertainties associated with the description of turbulent processes, other meteorologic inputs, and with estimations of emission rates. The model being developed is simple in concept and deals with the transport of pollutants by diffusing them in time and advecting them with the local wind velocity. The manner in which area-type source emissions are handled uses conventional source inventories to good advantage. A special procedure involving the calculation of up to two moments of the concentration distribution within each grid element insures a good resolution of concentration changes with time and space. Preliminary comparison of an observed fumigation with a numerical simulation indicates that the model adequately describes several features of the real phenomena. This model can be easily adapted to a number of applications, and can serve as a building block for more detailed studies in three dimension and of the transport of reacting materials. It is believed to be an appropriate tool to study transport of pollutants by local circulations, advection of air masses of varying stability characteristics, fumigation, and other time and space dependent phenomena. (Author summary modified)

23561 APTIC NO. 42978

Eschenroeder, Alan and Jose R. Martinez

AN EXTENSION OF K-THEORY TO DESCRIBE PHOTOCHEMICAL AIR POLLUTION. *Preprint, American Meteorological Society, Boston, Mass., and Air Pollution Control Assoc., Pittsburgh, Pa, 6p., 1971. 12 refs. (Presented at the Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-10, 1971.)*

An extension of the K-theory to photochemical air pollutants enables path-dependent processes, such as chemical depletion or production, to be described as closed form integrals. The main thrust of the extension is the addition of chemical reactions that are coupled through the species concentrations in a multicomponent mixture. The derived chemical model is described along with the application of Pade approximants to modeling calculations and the role of K-values in atmospheric photochemical/diffusion modeling.

23562 APTIC NO. 42777

Finzi-Contini, Bruno

A NEW VENICE AIR POLLUTION MULTIPLE SOURCE URBAN DIFFUSION MODEL. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1176. 3 refs. (Dec. 6-11, Paper ME 39C.)*

Pollution originating in the center of Venice is produced by domestic heating during the cold season and transported by northwesterly winds from the highly industrialized zone of Marghera and the adjacent larger residential zone of Mestre on the inner coast. It is maintained that local conditions are particularly favorable for studying the dispersion of pollutants by mathematical modeling. The sources are restricted as to nature, quantity, distribution, and period with wind systems not complicated by irregular terrain.

23563 APTIC NO. 43416

Fukuoka, S., M. Udagawa, S. Izumikawa, M. Funajima, and Y. Iwasaki

RELATIONS BETWEEN AIR POLLUTION BY SULPHUR DIOXIDE AND METEOROLOGICAL CONDITIONS AT VARIOUS LEVELS AT TOKYO TOWER (REPORT NO. 2). *In: Annual Report of the Tokyo Metropolitan Research Institute for Environmental Protection. Tokyo Metropolitan Environmental Protection Research Inst. (Japan), p. 1-9, 1971.*

The sources which cause sulfur dioxide pollution at the 225- and 125-meter levels at Tokyo Tower are different from those which cause the pollution at the 25-meter level. The sources from high chimneys in Kawasaki and Yokohama which are to the South of Tokyo Tower cause sulfur dioxide pollution at the 225 and 125-meter levels, and the sources in the surroundings of Tokyo Tower cause the pollution at the 25-meter level. This relationship is verified by the fact that the peak of the average hourly sulfur dioxide concentrations in the morning appears earlier at lower levels and that the pollution at the 225 and 125-meter levels is shown mainly for S to SSW wind, while the pollution at the 25-meter level is shown mainly for E to WSW wind. Since the higher sulfur dioxide concentrations than 0.5 ppm appear frequently at the 225 and 125-meter level, sulfur dioxide of fairly high concentrations is passing in the sky at Tokyo Tower. Seasonal variations are described. (Author summary modified)

23564 APTIC NO. 42799

Funabashi, Motohisa, Makoto Shioya, Tsuyoshi Sakanishi, and Koichi Haruna

PREDICTION OF AIR POLLUTION. *(Taiki osen yosoku shuho). Text in Japanese. Hitachi Rev. (English translation from Japanese of: Hitachi Hyoron), 54(6):65-70. June 1972. 10 refs.*

A prediction method of air pollution caused by sulfuric acid is discussed. The pollution phenomenon has a complex multiphase structure, each phase requiring its own method of prediction, which hitherto have been used making reference to a statistical study and simulation study using physical models, and citing suitable methods of prediction and model study for each type of pollution or each type of prediction purpose. The concept of model in the study of pollution prediction is clarified and the direction to which future model studies will proceed is suggested. (Author summary modified)

23565 APTIC NO. 43224

Goldsmith, P., H. J. Delafield, and L. C. Cox

THE ROLE OF DIFFUSIOPHORESIS IN THE SCAVENGING OF RADIOACTIVE PARTICLES FROM THE ATMOSPHERE. *Roy. Meteorol. Soc. Quart. J., vol. 89:43-61, 1963. 25 refs.*

Diffusiophoresis is the name of the phenomenon whereby particles of an aerosol, through which a vapor or gas is diffusing, experience a force which moves them in the direction of the diffusive flux of the vapor or gas. Experiments are described which show that the velocity cm/sec imposed on sub-micron particles in the case of water vapor diffusing in air, when the water vapor pressure is small compared with the total pressure, is governed by the equation: velocity equal to .0019(dp/dx), where dp/dx is the water vapor pressure gradient expressed in millibars/cm. The absolute efficiency of diffusiophoresis in scavenging radio active fallout particles from the atmosphere, because of cloud droplets growing by condensation, was deduced to be low. This was confirmed by a cloud chamber experiment in which inactive salt droplets were grown in the atmosphere of a radioactive aerosol. The washout due to diffusiophoresis accounts for less than 1% of the total observed washout of nuclear bomb debris for each condensation cycle occurring in nature. Cloud droplets would have to undergo over 100 condensation-evaporation cycles on the same condensation nucleus for diffusiophoresis to be responsible for most of the observed washout. (Author summary modified)

23566 APTIC NO. 42773

Green, A. E. S., G. D. Ward, T. Sawada, R. S. Sholtes, J. M. Schwartz, A. Deepak, D. Eisenhart, R. D. McPeters, and B. D. Reller

LIGHT SCATTERING AND THE SIZE-ALTITUDE DISTRIBUTION OF ATMOSPHERIC AEROSOLS. *J. Colloid Interface Sci., 39(3):520-535, June 1972. 47 refs.*

In a broad coordinated measurement program three different light scattering techniques were utilized to establish quantitatively the size and altitude distributions of atmospheric aerosols. The first technique is based on measurements of sky intensities within the aureole of the sun with a simple photographic arrangement which is used in conjunction with a Volz sun photometer. The second experimental method involves a bistatic laser measurement of the angular distributions of 0.694 micron light scattered from aerosols in the lower atmosphere. The ratio of scattering at angles from 8 to 172 deg to backscattering at 180 deg serves as an indicator of the size distribution. The third technique utilizes an aircraft borne Bausch and Lomb dust counter. These specific measurements based on light scattering techniques were made in conjunction with a much broader coordinated set of observations and analyses which gave information as to the particulate content of the sky on August 11 and 18, 1971 in Gainesville, Fla. Size altitude distribution compatible with all observations were obtained. Improvements, directions towards further progress, and the question of uniqueness are discussed. (Author abstract modified)

23567 APTIC NO. 43358

Griggs, M.

RELATIONSHIP OF OPTICAL OBSERVATIONS TO AEROSOL MASS LOADING. *J. Air Pollution Control Assoc., 22(5):356-358, May 1972. 7 refs.*

The aerosol mass loading of the atmosphere is an important parameter in monitoring local air quality, and on a global basis, it is important in determining the earth albedo and hence climate. Examination of the literature revealed that the relationships between local mass loading, the nephelometer scattering coefficient, and visibility could not be directly applied to vertical mass loading without modification. A theoretical relation between mass loading and turbidity is derived and compared with several other experimental approaches, in order to determine the best relationship.

23568 APTIC NO. 43177

Hales, J. M., J. M. Thorp, and M. A. Wolf

THEORY AND FIELD MEASUREMENTS OF SULFUR DIOXIDE WASHOUT FROM AN ELEVATED PLUME. *Preprint, American Meteorological Society, Boston, Mass., and Air Pollution Control Assoc., Pittsburgh, Pa., 2p., 1971. 4 refs. (Presented at the Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-7, 1971.)*

An experimental investigation was conducted in western Pennsylvania to measure the sulfur dioxide washout by natural precipitation from the plume of a large, coal-fired power plant. The investigation extended over three one-month periods in the vicinity of the Keystone Generating Station where 11 to 23 t of sulfur dioxide were released hourly from two 800-foot stacks. Precipitation samples were placed at various intervals encircling the generating station; those used for rain collection contained a solution of tetrachloromercurate (TCM) to prevent sulfur dioxide loss. Sulfur dioxide measurement employed a sulfamic acid variation method; use of a Technicon Auto analyzer permitted rapid assay of samples containing as little as 0.1 micromole/l. The results of this investigation seriously questioned the applicability of preexisting theory to the wash out of sulfur dioxide, since washout of sulfur dioxide was about two orders of magnitude less than predicted by preexisting theory; the observed relationship beyween washout and precipitation rate differed by a factor of two from that derived previously; washout concentrations of sulfur dioxide appeared to increase with distance from the stacks; and washout of background sulfur dioxide appeared to cause an inordinately strong interference with plume-washout observations. By virtue of physicochemical aspects of sulfur dioxide washout, the maximum concentration in precipitation incident on the ground apparently is reduced through elevation of the source by tall stacks. However, the concentration of sulfur dioxide in the plume will be decreased and the center of mass will be lowered by the absorption- desorption action of the precipitation. Hence, the total washout may increase rather than decrease with distance as predicted by preexisting theory. Definition of the resulting distribution of washout remains to be determined.

23569 APTIC NO. 42971

Hanna, Steven R.

COOLING TOWER PLUME RISE AND CONDENSATION. *Preprint, 6p., 1971. 10 refs. (Presented at the Symposium on Air Pollution Turbulence and Diffusion, Las Cruces, N. Mex., Dec. 7-10, 1971.)*

Cooling tower plume rise can be easily calculated for either uncondensed or completely condensed plumes. Due to the sensitivity of the condensation processes to slight changes in, for example, environmental mixing ratio, cooling tower plume rise in borderline cases cannot be calculated with so much confidence. Knowing the approximate wind speed and stability class, the Gaussian dispersion equation may possibly be used to determine the diffusion of water vapor or drops to the ground from the elevated cooling tower plume. If a thin elevated inversion layer is between the plume axis and the ground, dispersion of moisture to the ground may be inhibited. Nonlinear interactions between the plume and environmental heat and moisture may also prove to be important. Needs for further research with respect to cooling tower behavior are indicated.

23570 APTIC NO. 43548

Hanna, Steven R.

AN AIR QUALITY MODEL FOR KNOX COUNTY, TENNESSEE. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Air Resources Turbulence and Diffusion Lab., ATDL 55, 34p., Feb. 1972. 11 refs.*

Surface concentrations of sulfur dioxide (SO2) and suspended particles were calculated, using the ATDL urban dispersion model for a variety of meteorological conditions in Knox County, Tennessee. A detailed area and multiple point source inventory was used as input. The average observed concentration of suspended particles at six downtown sites was 106 micrograms/ cu m, while the average calculated concentration was 113 micrograms/cu m. Low level sources (household and commercial heating units and small industries) contribute as much as tall point sources to total surface concentrations of pollutants. In general, the taller stacks are not the main cause of high average surface concentrations. Over short time or space intervals, high surface concentrations may occur due to the mixing of the plumes from the high stacks to the ground. This model can be used in the future to estimate the impact of changes in stack heights or of patterns of emissions on patterns of surface concentrations.

23571 APTIC NO. 43384

Harihara Ayyar, P. S.

METEOROLOGICAL ASPECTS OF AIR POLLUTION. *Vayu Mandal, 1(1):10-15, Jan. 1971.*

Air pollution affects properties of the atmosphere by contributing to the incidence of fog, clouds, and precipitation; by creating heat islands, by reducing the solar radiation reaching the earth s surface; and by cutting off an appreciable fraction of its ultraviolet component. On the other hand, meteorological factors also greatly influence air pollution and its effects by dilution, dispersion, and transport of pollutants. Atmospheric reactions sometimes reduce the harmful ingredients of pollutants and sometimes create secondary and more toxic contaminants. Two air pollution catastrophies were directly related to meteorological conditions: the London smog of December 1952 and the Donora, Pennsylvania, tragedy of October 1948. An average man requires every day 3 lb of food, 1-1/2 times as much water, and 10 times as much air. Thus, of the body s intake, 8% consists of food, 12% of water and 80% of air. Man can live without food for 96 days and without water for a few days cannot exist without breathing air, even if it is polluted. This brings into focus the importance of studies of air pollution in all its aspects, including meteorological aspects.

23572 APTIC NO. 43204

Hellner, Crister and Richard A. Keller

FLASH PHOTOLYSIS OF SO2. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 32p., 1972. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-125.)*

When sulfur dioxide at low pressures is subjected to an intense photolysis flash, the characteristic, very structured SO2 absorption spectrum disappears immediately after the flash and is replaced by continuous absorption. The continuous absorption gradually decays and the normal SO2 absorption spectrum returns. The initial absorbance of the continuous absorption is proportional to the square of the SO2 pressure and the square of the flash irradiance. Formation of a metastable dimer of SO2 formed by the collision of two excited molecules is proposed from these facts. Some properties of this dimer are: natural lifetime, 2 sec; energy above separated monomers, 4kcal; lifetime at atmospheric pressure, 1 sec; absorption of ultraviolet light results in photodecomposition of the dimer into monomeric SO2. The long lifetime of this species and its low quenching cross section may make it an important intermediate in photochemical reactions of SO2. The relatively low energy of the metastable species indicates it may also be an intermediate in thermally excited reactions and perhaps it may be an important component of smoke stack effluent. The optical system for analyzing the transient absorption in the photolytic cell could be arranged in two ways: the spectrophotometric mode employed a direct current xenon lamp and photomultiplier, while the spectrophotographic mode employed a short delayed spectroscopic flash and photographic film. (Author abstract modified)

23573 APTIC NO. 42408

Hesler, Alexander von

THERMAL PHOTOGRAPHIC MEASURING FLIGHTS AS A METHOD FOR EXPLORING COLD-AIR FLOWS AND THE INFLUENCES OF VEGETATION. *In: Lufthygienisch-meteorologische Modelluntersuchung in der Region Untermain. 3. Arbeitsbericht: Infrarot-Thermographie. Regionale Planungsgemeinschaft Untermain, Frankfurt am Main (West Germany), p. 5-10, March 1972.*

The phenomenon of cold air flowing from the Taunus ridges of Germany into the Main river basin was investigated by means of thermal photographic measuring flights. Aside from the Taunus wind in the area under investigation, there is also a small-scale circulation caused by thermal differences between built-up areas and open land spaces. To understand the differing meteorological and climatic conditions in the green corridor and developed areas, a large network of measuring stations was created to gather data on wind direction and velocity, temperature, and moisture. The main obstacle to infrared scanning is that it measures surface temperatures not air temperatures. However, because colder ground surface temperatures contribute to the cooling of air and vice versa, the production and spread of cold air can be traced by this method when photograph interpretation is performed with great skill and care.

23574 APTIC NO. 43594

Hill, George R.

ANTICIPATING AND PREPARING AGAINST POSSIBLE INDUSTRIAL HAZARDS FROM AIR POLLUTION. *Air Repair, 2(4):132-137, May 1953. (Presented at the Manufacturing Chemists Assoc., Air Pollution Abatement Conference, New York, Feb. 25-26, 1952.)*

Proper stack engineering can alleviate the problems of sulfur dioxide emissions from non-ferrous smelting operations. Ground concentrations of SO2 around stack sites are reduced by mixing the smoke with air prior to emission, heating the smoke at the base of the stack, and increasing the height of the stack. However, the effects of these measures vary greatly in different smelters, depending on differences in topography, local meteorology, frequency, duration, structure, and nature of calms and temperature inversions, variability of winds, and differences in the industrial location and set-up. Temperature inversions are entirely different at Los Angeles, Salt Lake, and in the Columbia River Valley below Trail, British Columbia. Panoramic pictures and radiosondes can be used to study the characteristics of temperature inversions. A strong department of public relations has been found by certain companies to be of tremendous importance in dealing with farmers and the general public, particularly following a weather accident resulting in fumigation and suspected crop damage. Careful crop inspection is essential in determining the role of pollutant emissions in crop discoloration. It is recommended that aerial pictures be taken of fields and orchards in the vicinity of a new plant facility, before operation of the plant, to help in assessing later charges of crop damage due to plant operation.

23575 APTIC NO. 43450

Hiser, H. W., G. F. Andrews, and H. V. Senn

MONITORING OF THERMAL STABILITY AND TURBULENCE IN THE LOWER ATMOSPHERE BY RADAR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1972. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-144.)*

While signal strength fluctuations along a fixed path have been recorded in the past for other purposes, it is demonstrated that they can be used to yield valuable information on stability over a relatively large area from a single remote sensor. While conventional instrumentation might be installed to measure the same variations, a vast network would be required with attendant data readout, collection, and reduction problems. Suitable radars presently exist in or near most metropolitan areas. The present state-of-the-art electronics which would be added to each would be small in size, gather propagation-stability data from several path areas, and yield important meteorological information useful to air pollution meteorologists without affecting the present mission of the radars. The essential characteristics of the instrumentation are described. Surface and upper air data from the National Weather Service observation station at Miami International Airport were correlated with recording of radar signals. (Author conclusions modified)

23576 APTIC NO. 43429

Huff, F. A., R. C. Beebe, D. M. A. Jones, G. M. Morgan, Jr., and R. G. Semonin

PRELIMINARY REPORT. EFFECT OF COOLING TOWER EFFLUENTS ON ATMOSPHERIC CONDITIONS IN NORTHEASTERN ILLINOIS. *Illinois State Water Survey, Urbana, Illinois, Dept. of Registration and Education Circ-100, 38p., 1971. 28 refs.*

Calculations of the typical moisture balance from small showers and thunderstorms indicate that cooling tower releases of moisture at the Zion, Illinois nuclear power station would be very small when compared to natural fluxes. However, under unfavorable meteorological conditions, the cooling tower additions might result in increased down wind precipitation. The heat produced may represent a strong potential for affecting the local weather. The lake breeze-tower effluent interaction would only occur occasionally. Numerical cloud modeling indicates only a fraction of 1% increase in downwind precipitation. Snowfall could be increased 1 to 2 in. annually for about 2 mi inland. The interaction of tower effluent and the atmosphere is very complex and estimates of the environmental effects are largely speculative.

23577 APTIC NO. 43354

Idso, Sherwood B.

SOLAR RADIATION MEASUREMENTS AUGMENT AIR POLLUTION STUDIES. *J. Air Pollution Control Assoc., 22(5):364-368, May 1972. 10 refs.*

Measurements of the transparency of the atmosphere for solar radiation can be very useful in obtaining information about the dust content of the atmosphere. Several types of dust-induced effects upon atmospheric transparency are considered. These include long-term trends, seasonal trends, episode trends, and diurnal trends. The work involved was all carried out within the metropolitan Phoenix, Arizona, area. Pyranometer determinations are considered in light of concurrent meteorological conditions, and inferences are drawn with respect to spatial and temporal variations in airborne particles. Over the past two decades the local atmospheric transmitance for solar radiation decreased by approximately 7.5%, in response to the increasing urbanization of the Salt River Valley. The total dust content of the overlying atmosphere is greater in summer than winter, although the dust is more concentrated near the surface in winter. A general characterization of weak and strong pollution episodes is made and techniques are described for detecting subtle atmospheric turbidity variations over periods as short as a single day. (Author abstract modified)

23578 APTIC NO. 43231

Jacko, Robert B., George M. Palmer, and David L. Brenchley

A WIND TUNNEL STUDY TO DETERMINE THE AIR POLLUTION DISPERSION CHARACTERISTICS IN AN URBAN CENTER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1972. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-137.)*

A 1:400 scale model wind tunnel study was completed to determine the effect of building density within an urban center on the ground level dispersion of an air pollutant. Prismatic shaped buildings submerged in simulated atmospheric boundary layer flow with wind speeds less than 2 m/sec and an isothermal temperature profile were randomly located within a gridiron array of streets. Building density was varied in five levels from 10-100% and average height in two levels, 70 and 140 m. The flow field was developed using roughness elements on the wind tunnel floor upwind of the model. Both velocity profile and turbulence intensity were simulated. Oil smoke simulated a gaseous pollutant release from a low level point source located in the urban center, and the mass concentration of the tracer smoke was measured by an optical sensor. Increasing the average model building height by a factor of two for the same building density level resulted in a similar increase of ground level pollutant concentration at the further downwind avenues in the urban center. For the same average model height, increasing the building density produced radical adymmetric crosswind profiles and areas of high concentration pockets. The normalized concentration parameter was found to correlate in a specific manner with the characteristic roughness length and the downwind distance from the source. A Gaussian-type dispersion equation for neutral stability conditions underestimated the wind tunnel concentrations by four orders of magnitude. (Author abstract modified)

23579 APTIC NO. 43319

Koguchi, Kuniko, Udagawa Mitsuru, Frkuoka Saburo, and Yokota Hisaji

STUDIES ON CONCENTRATION OF SULFUR DIOXIDE CLASSIFIED BY DIRECTION AND VELOCITY OF THE WIND IN TOKYO. *(Tona- no Fuko Fusoku betsu ni mita Aryusangas nodo ni tsuite). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 3:33-39, 1972. 4 refs.*

Wind velocity and concentrations of sulfur dioxide were measured in Tokyo. Characteristics of the distribution of wind direction, velocity, and the concentration of SO2 were studied by classification of seasons (summer and winter) and areas (five measuring rooms, residential, central, and industrial areas of Tokyo.) The survey was done from June to Aug. 1968 in the summer, and from Dec. 1968 to Feb. 1969 in the winter. A south or south southwest wind prevailed in summer and a north or north-northwest wind in winter in Tokyo. The rate of appearance of the wind velocity 1.6 to 3.3 m/sec was about 60%, when the concentration of SO2 was high. Breezes and wind less than 3 m/sec caused the highest concentration during the summer in industrial areas. However, even if considerably stronger winds from the south prevailed, the concentration was 5 to 7 pphm. In the areas which were away from industrial areas, wind more than 3 to 4 m/sec caused pollution by SO2. High pollution occurred in northern areas when the south wind blowed, because of the Keihin industrial district located in the south. On the other hand, highly polluted spots (15 pphm) were located in the center of Tokyo only in winter. In the industrial areas the frequency of northerly wind increased in winter. Highly polluted areas existed in south winds in both winter and summer. The concentration of SO2 in winter was higher than in summer because of domestic heating in the heart of Tokyo and the worse weather conditions (inversions). In front of the Metropolitan Government Central Office, a little wind in all directions raised the concentration of the gas because of heating in the surrounding buildings. However, the Keihin industrial district influenced air quality in the center of Tokyo in winter and summer, when the wind was southerly.

23580 APTIC NO. 42411

Lamp, W.

OPERATION INFRARED. *In: Lufthygienisch-meteorologische Modelluntersuchung in der Region Untermain. 3. Arbeitsbericht: Infrarot-Thermographie. Regionale Planungsgemeinschaft Untermain, Frankfurt am Main (West Germany), p. 18-23, March 1972.*

Preparations to create the basis for assured investigational results in a series of inflight infrared air temperature scannings are reviewed. The strip of land selected for scanning runs in a southwest-northeasterly direction, parallel to the Taunus ridge, about 7 km to the southeast of it, at a width of up to 2.5 km and a length of 13 km. Photographs were taken with the scanner at vertical and inclined. The inclined position was such that on the left side in direction of flight, a strip up to 70 deg, measured from the vertical, was covered. To guarantee the pilot the best possible orientation for his flight routes, Autobahn flashing lamps, spaced 1 to 2 km apart, were installed as navigational markers on both the northern and southern measuring routes. Temperature readings taken from the middle of the Main river at the exact moment the scanning plane passed overhead provided a reference temperature for the interpretation of the photographs. Weather conditions necessary for flights were wind velocity below or equal to 3 knots at the Rhein-Main Airport and either no clouds or very light, high cloudiness over the airport. Measuring flights were planned in the evening for 1 hour before sunset; at sunset; and up to two hours after sunset. Similarly, flights were planned for the morning around the time of sunrise.

23581 APTIC NO. 43437

Lantz, R. B.

APPLICATION OF A THREE-DIMENSIONAL NUMERICAL MODEL TO AIR POLLUTANT CALCULATIONS.

Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1972. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-141.)

A mathematical model is presented that can provide the environmental answers which make plant design, location, and day-by-day operation consistent with both public welfare and operational economy. Finite difference techniques are used to solve two sets of partial differential equations. The first set describes three-dimensional wind flow, accounting for topography and includes inviscid potential flow at high elevations and height-dependent coefficients which account for surface friction in the boundary layer. The second set describes the three dimensional convection and turbulent diffusion of a pollutant released into the air. The pollutant material balance includes the effects of simple chemical reaction and ground adsorption. The numerical model utilizes efficient computational schemes which give good accuracy but yield low computing costs. The model can calculate the entire transient behavior of emitted pollutants, or, since there are no time step limitations, the steady-state concentration distribution with equal facility. Results are presented from applying the model to a variety of meteorological conditions; examples include valley winds and fumigation breakup of a temperature inversion. For simple, level terrain cases, calculated results are in good agreement with the Gaussian plume models; for complicated terrain, the numerical model gives more accurate and quite different results than do the plume models. (Author abstract modified)

23582 APTIC NO. 42412

Lorenz, D.

INVESTIGATION OF COLD-AIR FLOWS AT THE TAUNUS MOUNTAINS THROUGH THE USE OF THERMAL MAPPING.

In: Lufthygienisch-meteorologische Modelluntersuchung in der Region Untermain. 3. Arbeitsbericht: Infraot-Thermographie. Regionale Planungsgemeinschaft Untermain, Frankfurt am Main (West Germany), p. 23-53, March 1972. 11 refs.

Thermo-photographs of the area located at the foot of the Taunus mountains, roughly between the Schwarzbach and Steinbach valleys, were taken by an infrared line scanner built into an aircraft. The instrument, consisting of a rotating lens system operating at 16 rps, and a radiation detector, projects a continuous scan of the terrain below the airplane. The radiation values are synchronously exposed on a photographic negative film so that the variations in radiation eventually appear as differences in film density. Due to the interdependence of emitted long-wave radiations and ground sufrace temperature, the variations in film density can clearly be interpreted as ground surface temperature differences. The problems of drawing conclusions concerning air temperature from ground temperature readings are discussed. The cold air which causes fresh-air flows coming from the Taunus and its foothills, originates primarily on slopes with low vegetation. The production of cold air is much less over high forest and closely built-up areas. The path followed by cold air leads down the slopes and then follows the course of the valleys. The wind velocity in the valleys increases in proportion to the area available for the production of such cold air. This intensity is also dependent on the width of the valley, while the gradient of the valley bottom apparently has a much smaller effect. The flow of air may be obstructed by dams, constricted valleys, valley bends, dense rows of trees or hedges, forests that extend into the valley profile, and areas that are densely built-up. While a loss in wind velocity cannot be found downstream after flowing across an obstruction, an increase in air temperature extends well beyond each settlement.

23583 APTIC NO. 42612

Mack, E. J., W. C. Kocmond, R. J. Pilie, U. Katz, and O. H. Vaughan, Jr.

SOME MICROPHYSICAL FEATURES OF COASTAL AND INLAND FOGS.

Preprint, American Meteorological Society, Boston, Mass., p. 219-224, 1972. 2 refs. (Presented at the International Conference on Aerospace and Aeronautical Meteorology, Washington, D. C., May 22-26, 1972.)

The microphysical characteristics of fog occurring at Elmira, N. Y. and Vandenberg and Los Angeles, Calif. are examined. Visibility was measured with several 30-meter baseline transmissometers; liquid water content (LWC) was measured by a filter weighing technique; drop-size distributions were obtained by a gelatin replication technique; and haze and cloud nuclei were measured with a thermal gradient diffusion chamber. Radiation fogs sampled at Los Angeles possessed low visibilities, high LWC, relatively small drops, narrow peaked drop-size distributions, and high concentrations of micron-sized haze droplets. Typical characteristics of valley fogs observed at Elmira were low visibilities, moderately high LWC, low concentrations of haze droplets, and drop-size distributions similar to those measured in Los Angeles. Advection fogs observed in Vandenberg were characterized by less severe visibilities, low LWC, large drops in a broad drop-size distribution, and very low haze nucleus concentrations. Measurements of nucleus concentrations in the Los Angeles Basin show that, in addition to the predictably high concentrations of Aitken nuclei, there are large numbers of particulates which are extremely effective condensation sites, i.e., haze and cloud nuclei. (Author summary modified)

23584 APTIC NO. 42776

Mahoney, James R. and Bruce A. Egan

A MESOSCALE NUMERICAL MODEL OF ATMOSPHERIC TRANSPORT PHENOMENA IN URBAN AREAS.

International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1152-1157. 3 refs. (Dec. 6-11, Paper ME 32E.)

Air pollution prediction models which more accurately reflect urban scale meteorological phenomena have been developed using an advection-diffusion equation as the basic model equation. The three types of meteorological models considered require solutions of partial differential equations which were transformed into finite difference analogs for the computation of approximate solutions. Investigating the influence of local meteorological conditions on air pollution distributions, the models can indicate expected concentration patterns in the case of trapping of pollutants in an elevated stable layer, horizontal and vertical variability of wind speed and diffusion coefficients in urban areas, and fumigations at ground level during inversion breakup conditions. Initial results indicate the important influence of two model parameters, wind speed and diffusion coefficient distributions, on the estimates of ground level concentrations.

23585 APTIC NO. 43638

Mammarella, L. and A. L. Santi

DIFFUSION MODULE OF VEHICLE GENERATED POLLUTANTS IN THE AMBIENT AIR.

(Modulo di diffusione di inquinanti veicolari in ambiente aperto). Text in Italian. Geofis. Meteorol., 20(3/4):106-114, March-Aug. 1971. 28 refs.

Aerosols emitted by vehicular sources were measured by directed impaction samplers at different levels above the ground (0.5, 3, and 6m) on an urban street characterized by massive traffic. The samplers adequately illustrated and defined the subdivision of aerosols according to size class. Small aerosols tended to rise and dilute quickly. In one way streets with a high density of traffic, therefore, the diffusion of vehicle pollutants is fairly speedly. Public transportation should be equipped with exhausts oriented at the top.

23586 APTIC NO. 43394

McAdie, H. G. and D. K. A. Gillies

THE OPERATIONAL FORECASTING OF UNDESIRABLE POLLUTION LEVELS BASED ON A COMBINED POLLUTION INDEX. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 17p., 1972. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-183.)*

Several air pollution indexes have been developed for control action and public information. The majority of these are based upon some combination of sulfur dioxide and particulate matter levels, since epidemiological studies indicate a relationship between severity of health effects and these constituents. The application of one such index, in conjunction with synoptic meteorological forecasting, to an operational program for forecasting pollution potential in the Sarnia, Ontario, petrochemical complex is described. The system has operated for over 5 years with approximately a 70% accuracy of predicting adverse situations. The performance of this program indicates that meteorological forecasts can be used successfully to provide major sources with the advance information necessary to effect any additional control measures relevant to their individual operations. Air pressure, wind direction and velocity, and the presence of thermal inversion conditions from the core for the meteorological data.

23587 APTIC NO. 42952

Middleton, J. B. and A. J. Tigges

ACTION OF SPECIFIC AIRBORNE CONTAMINANTS. *Proc. Am. Power Conf., vol. 24:491-499, 1962. 5 refs.*

The behavior of particulates and sulfurous gases in the atmosphere and their effects on living conditions, materials, and vegetation are discussed. There are two basic conditions under which sulfurous flue gases and associated solids are most disturbing to a community. They are the cool days of stagnation where there is deep fog, and the windy days where the flue gases are carried to ground level. In the former, annoying, irritating smogs are formed and in the latter, dousing and fumigating of the area take place. During the period of field studies and analyses of the airborne contaminants in the area of Seward, Pennsylvania, it became evident that the two major nuisances were sulfur trioxide (resulting in sulfuric acid mist) and airborne solids. To alleviate conditions such as these entrapment of dirty flue gases in fog banks must be prevented, and downwash due to atmopsheric turbulence must be minimized. This is accomplished by cleaning flue gases to achieve an optically clear stack, by jetting the flue gases upward at a velocity of 120 ft/sec, and by maintaining the gas temperature at 265 to 285 F. The fate of sulfur dioxide released into the atmosphere from combustion stacks and other sources is discussed. Sulfurous gases are present in the troposphere and enter the stratosphere by mixing. Investigations of the possible presence of damage to vegetation in the area adjacent to the Seward Generating Station showed serious damage only in the foliage of the Easter white pine. The tips of the needles that had persisted from the previous season had become red and showed considerable desiccation.

23588 APTIC NO. 42374

Moses, Harry, Donald F. Gatz, James E. arson, Frank C. Kulhanek, and Gunther A. Zerbe

THE ANANTOMY OF AN AIR POLLUTION EPISODE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1972. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla. June 18-22, 1972.)*

During the first two weeks of Nov. 1969, horizontal visibility through the atmosphere decreased to near zero in Chicago and higher than normal concentrations of pollutants were measured in the lower atmosphere over the city. The pollutant concentrations observed during the period are discussed, together with the meteorological conditions that may have influenced them. Air quality and meteorological data are presented in several different forms: maps showing the distribution of sulfur dioxide concentrations over the city at various times throughout the episode, as measured by the City of Chicago's Telemetered Air Monitoring Network, surface and 500-mb synoptic meterological charts, time-height cross-sections of temperature, wind speed, and wind directions, and time variations of meteorological and air quality parameters. One-hr average SO2 concentrations of up to 0.75 ppm were observed in local areas; the areas affected were determined by the distribution of sources and the wind direction. The dominant synoptic feature of the period was a very slow-moving region of small pressure gradient, which resulted in light surface winds. Temperature inversions accompanied the highest ground-level SO2 concentrations. To compare pollution conditions during this episode with conditions during the same period in other years, city-wide average SO2 concentrations were computed for each Nov. day for the years 1966, 1967, and 1968, and 1969. For Nov. 4-12, the period of the episode, 1969 had the highest city-wide daily average only once, on the 6th. For the entire month, 1969 had the highest city-wide average on only three days. Thus, while much public attention was focused on the 1969 episode, and state standards for SO2 were at times exceeded, city-wide daily SO2 concentrations were not particularly high when compared with the same period of the previous three years. (Author abstract modified)

23589 APTIC NO. 43229

Moses, Harry and Martin R. Kraimer

PLUME RISE CALCULATIONS USING SELECTED FUNCTIONAL FORMS AND THE TABULATION PREDICTION TECHNIQUE. *Preprint, American Industrial Hygiene Assoc., Detroit, Mich., 44p., 1971. 18 refs. (Presented at the American Industrial Hygiene Association, Conference, Toronto, Ontario, May 24-28, 1971.)*

A new method for determining plume rise was derived from single-stack plume-rise data taken from a wide range of stack sizes with complete information on meteorological and engineering stack parameters. The functional forms of conventional plume rise equations were examined, and improved coefficients were obtained based on least squares techniques. According to the tabulation prediction technique, the plume rise is determined from a multivariate contingency table, in which values of the independent variables are arranged in an ordered sequence, and relevant statistical features of the dependent statistical features of the dependent variables are given. This method has definite advantages over conventional plume rise formulas. (Author abstract modified)

23590 APTIC NO. 42838

Muramatsu, Hisafumi, Mitsugi Kyozuka, and Masao Misaki

A ROCKET MEASUREMENT OF THE VERTICAL DISTRIBUTION OF ATMOSPHERIC OZONE. *Papers Meteorol. Geophys. (Tokyo), 22(3/4):209-227, Nov. 1972. 38 refs.*

Ozone number densities in the altitude range 22-62 km were determined by rocket measurement of the absorption of solar ultraviolet radiation in three bands within the range 250-370 nm. Because of parachute failure, profiles of air temperature and wind could not be obtained. The results generally showed a good agreement with other experimental data. The profile supported the theoretical profiles for the moist atmosphere model rather than for the oxygen atmosphere model above 30 km. The data were not in good agreement with balloon-borne chemical ozonesonde data for altitudes between 30 and 22 km.

23591 APTIC NO. 42839

Nakai, Sadao, Tetsuo Imagawa, Toshiaki Kashihara, Yasukaszu Izawa, and Chiyoe Yamanaka

OBSERVATION OF AEROSOL IN THE UPPER ATMOSPHERE BY LASER LOADED ON A ROCKET. *Technol. Repts., Osaka Univ., no. 22:193-200, Feb. 1972. 10 refs.*

A laser radar system which can be loaded on a rocket was developed and applied to measurements of aerosol in the upper atmosphere. The system consists of a GaAs semiconductor laser light emitter, a scattered light detector and data processing system. The basic principles of operation, operating procedures, instrumentation, and results of field tests are reviewed. Scattering layers of the value of Nsigma equals 10 to the -12th/cm/ster were observed at the altitude of 40-50, 120, 170, and 190-200 km. The new techniques of the laser radar system can be applied to pollution measurement on the earth s surface.

23592 APTIC NO. 42761

Nisbet, Ian C. T. and Adel F. Sarofim

RATES AND ROUTES OF TRANSPORT OF PCBS IN THE ENVIRONMENT. *Environ, Health Perspect., 1972:21-38, April 1972. 85 refs.*

Polychlorinated biphenyls released in the North American environment in the past are concentrated in three main sinks: roughly 300,000 tons are buried in landfill dumps, 20,000 tons are buried in river and Great Lake sediment, and 10,000 tons are probably buried in the sediment of the Continental Shelf. About 20,000 tons have been distributed by aerial fallout and disposal from ships over land and sea. Transfer probably takes place by volatilization, aerial transport on particulates, leaching from dumps, and the processes of sedimentation. Transfer by biota is quantitatively unimportant, but is of major biological significance. The North American producer has voluntarily reduced sales, and inputs into the environment are expected to decrease. Research must be encouraged to explore all aspects of PCB transport because the dispersal of relatively small fractions into sensitive areas can apparently cause relatively high levels of contamination of the biota. (Author conclusions modified)

23593 APTIC NO. 43250

Nordo, ʼack

A EUROPEAN PLAN FOR INVESTIGATION OF LONG RANGE TRANSPORT OF AIR POLLUTANTS. *Int. Air Pollut. Control Noise Abatement Exhib. Conf., (Proc.), Jonkoping, Sweden, 1971, p. 1:58 to 1:83. (Sept. 1-6.)*

Extrapolations from the results of air pollution studies confined to the nearest few km from a stack are frequently misleading. As a demonstration, some mesoscale patterns are briefly discussed. The urban region of Oslo is used as an illustration. The distribution of soot and concentration of sulfur in airborne particulate matter both show typical large scale patterns over the European continent. Because there are indications that a long range mass transport of air pollutants takes place across Europe and the reported increase of acidity in precipitation has created great concern in Scandinavia, a plan has been proposed for an integrated survey of pollutant levels for the entire continent of Europe. Participating countries would be responsible for carrying out their respective national programs of emission surveys, air sampling at ground and from airplanes, and analyses in relation to the project. Each country would provide monthly values of sulfur emission in regions of approximately 200 km by 200 km. All surface stations would make daily observations during the years 1972-1974 and provide samples to be used for the determination of strong acid and sulfate in precipitation sulfur dioxide in the gas phase, and total sulfur content of particulate matter. A central project administration is required to handle data processing, numerical analysis, and model development, to be responsible for the continuous planning and coordination of the program, and for the analysis of the resulting data.

23594 APTIC NO. 43438

Nudelman, Harold I. and John A. Frizzola

A CASE STUDY OF AN AIR POLLUTION INCIDENT DUE TO A STATIONARY FRONT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 28p., 1972. [illegible] (Presented at the Air Pollution Control Associati[illegible] nual Meeting, 65th, Miami, Fla., June 18-22, 1972, [illegible] 72-138.)*

In January 1971, the New York City area experienced a period of high pollution in which concentrations exceeded the present criteria for Stage I of the New York City Alert-Warning System. This incident was unusual because the high concentrations were associated with a weak frontal system which moved back and forth over the area and not with a stagnating anticyclone. Pollutant concentrations were closely related to the movement of the frontal system as well as to changes in wind speed and stability. Climatological criteria for identifying periods of potential high air pollution and the criteria for mixing heights, transport wind speed, and ventilation factors necessary for the issuance of an official advisory from the National Meteorological Center were not met during this incident. Therefore, some reevaluation and redefinition of these criteria are recommended. (Author abstract)

23595 APTIC NO. 43576

Perelman, A. Ya. and K. S. Shifrin

USE OF LIGHT SCATTERING FOR THE DETERMINATION OF THE STRUTURE OF DISPERSE SYSTEMS WITH A POWER-LAW DISTRIBUTION. *Opt. I Spektroskopiya (English translation), 26(6):548-551, 1969. 14 refs.*

A calculation of the polydisperse coefficient of scattering and the polydisperse luminousity is presented for a model with a power-law distribution which is used in the description of an atmospheric aerosol. Two methods were developed, permitting the calculation of the particle size distribution using optical information. Information about the three-dimensional polydisperse scattering coefficient and the poydisperse scattering indicatrix served as input data. Solution of the inverse problems is given in the form of contour integrals. A method is given for the separation of the single valued branch, describing the desired distribution of particles. (Author abstract modified)

23596 APTIC NO. 42899

Peskin, Richard L.

ANALYTICAL STUDY OF TURBULENT DIFFUSIVITY. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1109-1115. 25 refs. (Dec. 6-11, Paper ME 26E.)*

Applications of Langevin modeling to turbulent diffusion are discussed. A dynamically consistent Langevin model was used to study single and two-particle motions in homogeneous turbulence. For shear-flows a kinematic type Langevin model was used to study the dispersion effect. The shear-flow study results in short or long time diffusion laws and indicated various effects that shear stresses may have on dispersion. Application of the Langevin theory to model the stochastic nonlinear forcing function for the aerosol particle dispersion problem leads to results which identify the role played by particle mass in its relative dispersion, and the role played by Eulerian and Lagrangian scale sizes of the embedding fluid flow. A full understanding of the Eulerian Lagrangian problem is necessary before the aerosol dispersion problem can be fully solved. (Author summary modified)

23597 APTIC NO. 42789

Pickering, W. M.

THE DIFFUSIVE MOTION OF AN INITIALLY SPHERICALLY SYMMETRIC CLOUD OF IONIZATION IN THE EARTH S UPPER ATMOSPHERE. *Planetary Space Sci., 20(2):149-156, 1972. 8 refs.*

The diffusive motion of an initially spherically symmetric ion cloud in the presence of a magnetic field (the geomagnetic field) is investigated. The electric field is assumed to be the space charge electric field, and the possible effects of neutral air motion are ignored. Data appropriate to an altitude of 97.5 km are used and the computed results are compared with an exact (similar type) solution. For the range of time considered, the electric field is directed mainly outwards from the center of the cloud, apart from the effects which are possibly due to the finite nature of the idealization. Furthermore, the isolines of electron density appear to be of elliptical shape, especially near to the center of the region, where the effect of the boundary is likely to be least.

23598 APTIC NO. 42386

Pivovarova, Z. I., and T. A. Krayushkina

CONTRIBUTION TO THE DECREASE OF ATMOSPHERIC TRANSPARENCY. *(K voprosu o ponizhenii prozrachnosti atmosfery). Text in Russian. Tr. Gl. Geofiz. Observ. (Moscow), no. 263:19-38, 1970. 17 refs.*

Results of systematic measurements of the atmospheric transparency at 33 stations in the European and Asiatic territories of the USSR are analyzed. A decrease of 0.05-0.10 cal/sq cm min in the direct solar radiation accounts for 0.02-0.03 decrease in the transparency coefficient. The turbidity factor increased by 0.3-0.5 by the 1960 s, corresponding to an increase of 10-15% in comparison with the 1930 s. Investigations of the distribution of the transparency coefficients during the 1930 s and 1960 s revealed a general decrease in the atmospheric transparency. While the frequency of medium transparency coefficients was 47% in the 1930 s, it was 30% in the 1960 s, and the frequency of high coefficients fell from 30% to 20% by the 1960 s. At the same time, the frequency of highly reduced coefficients rose from 4% to 12%. The frequency of highly reduced coefficients was lower (12%) and the duration of periods with high transparency coefficient higher (28%) over the Asiatic than over the European USSR territory, where the corresponding values were 19% and 20%. Investigations of the yearly transparency variations showed 4 to 6 times higher frequency of low transparency coefficients in summer than in winter, while the frequency of normal transparency coefficients has its maximum (40-45%) in spring. High transparency coefficients have maximum frequency in winter (40-50%), while the corresponding value for the rest of the year lies at 15-20%. Very high transparencies have their maximum frequency during November. The frequency of high transparency coefficients is considerably higher over northern than over southern territories. The decrease of the transparency was particularly high over urban and industrial areas as a result of the increase in the turbidity due to aerosols.

23599 APTIC NO. 42879

Quinio, R. Le

RECENT TEACHINGS OF AIR DIFFUSION EXPERIMENTS AT DIFFERENT FRENCH SITES. *(Recents enseignements d experiences de diffusion atmospherique en differents sites francais). Text in French. International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 983-987. 16 refs. (Dec. 6-11.)*

Results and problems of diffusion studies carried out with a uranin tracer at different sites in France are discussed. The tests were related to industrial point sources, and the concentration variations were determined within a radius of about 10 kms. The difficulties involved in siting experiments and elaborating an appropriate theory considering meteorological parameters as well as durations of emission, pollutant transport or distance, and exposition time are described. Considerable dispersion due to thermal effects and probably to dynamic effects caused by homogeneity and high buildings was observed. The low concentrations found within 1-10 km indicated rapid dispersion, especially within the first few 100 meters. The highest concentrations were measured at the highest wind speed, which indicates accumulation of pollutants in more or less isolated masses. Wind direction was identified as the basic meteorological parameter to be considered in dispersion studies of point sources. Besides uranin, neutron-activated gold and indium as well as tritium and chlorine trifluoride were applied as tracers.

23600 APTIC NO. 43577

Reiter, Elmar R.

ATMOSPHERIC TRANSPORT PROCESSES, PART 3: HYDRODYNAMIC TRACERS. *Oak Ridge, Tenn., Atomic Energy Commission, Technical Information Center, May 1972, 219p., 419 refs.*

NTIS: TID-25731

Hydrodynamic and thermodynamic quantities that are quasi-conservative in atmospheric large-scale flow patterns and hence may be used as air-mass tracers are reviewed. Foremost among such tracers are adiabatic air motions on isentropic surfaces under conservation of energy. Consideration of such motions leads to the construction of isentropic trajectories. Detailed descriptions of trajectory construction techniques are included. Conservation of potential vorticity also serves as a powerful tool in tracing air masses of stratospheric or tropospheric origin. Isentropic trajectory and potential vorticity analyses serve to illustrate the large-scale exchange processes between troposphere and stratosphere. Transport processes in the planetary boundary layer which are complicated by diurnal diabatic heating and cooling are also described.

23601 APTIC NO. 42947

Reynolds, Steven D.

NUMERICAL INTEGRATION OF THE CONTINUITY EQUATIONS. APPENDIX D OF DEVELOPMENT OF A SIMULATION MODEL FOR ESTIMATING GROUND LEVEL CONCENTRATIONS OF PHOTOCHEMICAL POLLUTANTS. *Systems Applications, Inc., Beverly Hills, Calif., Air Pollution Control Office Contract CPA 70-148, Rept. 71-SAI-12, Rept. APTD-0911, 27p., June 1971. 4 refs.*

NTIS: PB 206412

A variant of the method of fractional steps was adopted for numerical integration of the continuity equations in the development of a simulation model for estimating ground level concentrations of photochemical pollutants. The approach is based on the repeated but separate solution of three two-dimensional problems -- in (x,t), (y,t), and (z,t) space -- at each time step. The solution procedure is implicit and iterative in (z,t) space, explicit and direct in (x,t) and (y,t) space. Truncation errors incurred due to the finite difference aproximation have been examined in tests of second and forth order methods, as applied to the horizontal advective portions of the fractionated equations -- the (x,t) and (y,t) problems. The fourth order procedure appears to be significantly more accurate in treating horizontal advection. Experience indicates that the procedure (with second or fourth-order aproximation included) is stable and poses no particular computational difficulties.

23602 APTIC NO. 42796

Ripperton, Lyman A., Harvey E. Jeffries, and James J. B. Worth

RELATIONSHIP OF MEASUREMENTS IN NON-URBAN AIR TO AIR POLLUTION: OZONE AND OXIDES OF

NITROGEN. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 386-390. 12 refs. (Dec. 6-11, Paper CP 13B.)*

Monitoring in some non-urban areas is necessary to obtain a base line and to document the encroachment of air pollution on these remote regions. Measurements in non-urban areas can also provide data pertinent to the mechanisms and rates of pollutant removal from the atmosphere. Data on ozone and nitrogen oxides, selected for pertinence in interpreting the problems of urban atmospheric pollution, were obtained in a number of non-urban environments. These data suggest that values of over 8.0 pphm of O_3 are the result of anthropogenic pollution. Data on nitrogen oxides values do not suggest a peak value which represents anthropogenic pollution, but do indicate that continued exhibition of 2.0 pphm or above does infer anthropogenic pollution. The values should not be accepted as rigid. Behavior of air pollutants is affected by topographical features and other characteristics of the underlying surface; many factors can cause sharp concentration gradients in both the horizontal and the vertical. The first steps of a major sink for nitrogen oxides is atmospheric reaction with O_3. Many features of atmospheric transport can be deduced from surface chemical measurements. For example, increased vertical mixing is accompanied by decreased nitrogen oxides values and increased O_3 concentrations. A refinement of techniques, including use of chemical kinetics, should provide meteorologists with tools for determining various aspects of micro-, meso- and macroscale air movement from surface measurements.

23603 APTIC NO. 42368

Robinson, Elmer and Charles E. Moser

GLOBAL GASEOUS POLLUTANT EMISSIONS AND REMOVAL MECHANISMS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1097-1101. 19 refs. (Dec. 6-11, Paper ME 26B.)*

Global air pollution is analyzed from the basis of total global emissions and atmospheric scavenging processes. Since air pollutio is closely associated with industrial products and industrial operations, it is also useful to examine the trends that could affect air pollution from industrial activities in both the industrial and yet-to-be industrialized countries. These two factors can then provide a basis for evaluating the possibilities that air pollution problems may expand from the presently affected local areas to hemispheric and global scales. Estimates of pollutant emissions and a general source breakdown are given for sulfur dioxide, nitrogen dioxide, carbon monoxide, and hydrocarbons. On the basis of estimates of emissions, atmospheric concentrations, and probably reaction rates, estimates of the likely residence time of pollutants in the atmosphere or global buildup can be made.

23604 APTIC NO. 43401

Robinson, George D.

GLOBAL ENVIRONMENTAL MONITORING. *Technol. Rev., 73(7):18-27, May 1971.*

The 1970 Study of Critical Environmental Problems identified eight critical global environmental problems: biological effects of the presence in the environment of long-lived toxic chlorinated hydrocarbons; biological effects of the presence in the environment of toxic heavy metals in assimilable form; possible climatic effects of the increasing carbon dioxide content of the atmosphere; possible climatic effects of particulate matter in the atmosphere; possible climatic effects of contamination of the stratosphere by transport aircraft; biological effects of the escape of petroleum oil into the environment; the effects of physical and thermal changes at the earth s surface, including changes in land use; and biological effects of the escape of nutrients into the environment. The recommendations of the SCEP in all cases involved the upgrading of the global air and water-monitoring network. In particular, emphasis was placed on the establishment of a baseline from which changes in environmental pollutant levels can be determined. Proposals were endorsed for immediate two-year survey of the baseline--an urgent program involving about 1000 sampling points covering the oceans and the major rivers and glaciers. A system of about 200 permanent monitoring station s was also recommended. A satellite system might provide a feasible method for the important task of measuring changes in global albedo.

23605 APTIC NO. 42768

Schiff, Daphne, H. I. Schiff, and P. R. Gendron

THE USE OF A DIFFUSION CLOUD CHAMBER TO CHARACTERIZE CONDENSATION NUCLEI. *Can. J. Chem., 31(11):1108-1117, Nov. 1953. 6 refs. (Presented at the Chemical Institute of Canada, Annual Conference, 36th, Windsor, Ontario, June 3, 1953.)*

By characterizing nuclei according to the degree of supersaturation which they will tolerate, it was hoped that the property responsible for nucleation power would become evident. The original Langsdorf diffusion cloud chamber was modified so that the temperature gradient obtained could be controlled. The supersaturations thus produced could then be calculated from a diffusion equation. The effectiveness of various inorganic nuclei in causing condensation in this supersaturated vapor was studied. Nucleation power was observed to vary as the weight of the cation used. (Author abstract modified)

23606 APTIC NO. 43477

Schneider, Stephen H.

ATMOSPHERIC PARTICLES AND CLIMATE: CAN WE EVALUATE THE IMPACT OF MAN S ACTIVITIES? Inst. of Environmental Sciences, Mt. Prospect, Ill., Proc. Inst. Environ. Sci. Annu. Tech. Meet., 18th, New York, p. 537-563. 32 refs.

Recent research concerning the question of atmospheric aerosols and climate is summarized, and suggestions are made for the kinds of observational and theoretical experiments which remain to be performed before the effects of particles on the global climate can be accurately determined. An increase in the number concentration and mass of suspended particles, as well as an upward trend in turbidity and a decrease in the average particle size, can be documented for much of the area of the Northern Hemisphere. However, detailed knowledge of the intensity and location of sources and sinks of particulate matter, as well as the geographic and vertical distribution of suspended atmospheric particles, is still very unsatisfactory. Global-average models of the radiation balance using reasonable estimates for aerosol optical properties indicate that an increase in the particle loading of the atmosphere could significantly increase the albedo of the earth--presumably resulting in a decrease in the temperature of the earth s surface. Even a change of a few percent in global albedo may be sufficient to cause extensive changes in the fields of polar ice. However, better data for aerosol optical properties must be obtained. Large-scale numerical models of the land-ocean-atmosphere system should be developed to determine how changes in the radiation balance from increased aerosols might evoke simultaneous variations in other atmospheric variables.

23607 APTIC NO. 43541

Seinfeld, John H., Thomas A. Hecht, and Philip M. Roth

DEVELOPMENT OF A SIMULATION MODEL FOR ESTIMATING GROUND LEVEL CONCENTRATIONS OF PHOTOCHEMICAL POLLUTANTS. APPENDIX B. A KINETIC MECHANISM FOR ATMOSPHERIC PHOTOCHEMICAL REACTIONS. *Systems Applications, Inc., Beverly Hills, Calif., Air Pollution Control Office*

Contract CPA 70-148, Rept. 71SAI-9, Rept. APTD-0909, 53p., May 1971. 36 refs.

NTIS: PB 206410

The quantitative description of the rates of chemical reaction of atmospheric contaminants is a vital ingredient in the formulation of a model capable of predicting accurately ground level concentrations of gaseous pollutants. Existing kinetic mechanisms were assessed, arriving at the conclusion that a better model was needed. A new kinetic mechanism is presented, and it is demonstrated that this model is capable of predicting with acceptable accuracy the concentration/time behavior of smog chamber experiments for propylene, isobutylene, n-butane, and a mixture of propylene and n-butane at initial oxides of nitrogen to hydrogen ratios of 1/3 to 1. The mechanism is also shown to simulate accurately the effect on photooxidation rates of variations in carbon monoxide concentrations, as well as the inhibitory effect of high initial concentrations of nitric oxide on the maximum concentration of ozone obtained. Adaptation of this validated mechanism is discussed for use in an urban airshed model.

23608 APTIC NO. 42733

Shinn, Joseph H.

AN INTRODUCTION TO THE HYPERBOLIC DIFFUSION EQUATION. *White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., DA Task IT06 1102 B53A-17, Army Electronics Command Rept. ECOM-5341, OSD-1366, 17p., Nov. 1970. 13 refs.*

NTIS, DDC: AD 718616

The theoretical basis for a hyperbolic form of diffusion equation which offers advantages over the classical parabolic form is discussed. The hyperbolic diffusion equation differs from the classical parabolic equation in the ostensible second derivative of the particle density (i.e., probability) with respect to time. The premises are introduced in simplified form for application by meteorologists. The Markov process in phase space and the Lagrangian-Eulerian transform are discussed. Derivations of the hyperbolic equation, one from momentum consideration and one using a Markov process, are presented. The hyperbolic diffusion equation offers advantages over the classical parabolic equation in the possibility of obtaining exact solutions and in the realistic physical assumptions under which it is derived.

23609 APTIC NO. 43439

Sklarew, Ralph C., Allan J. Fabrick, and Judith E. Prager

MATHEMATICAL MODELING OF PHOTOCHEMICAL SMOG USING THE PICK METHOD. *Preprint, Air pollution Control Assoc., Pittsburgh, Pa., 28p., 1972. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-140.)*

A new method for solving the turbulent atmospheric diffusion equation was developed based on Lagrangian mass points, or particles, moving through an Eulerian grid. The method is one of a family of Particle-In-Cell techniques but is a unique extension to incorporate the effects of turbulent diffusion based on K-theory; thus the acronym PICK. In a three-dimensional computeraided model, NEXUS (Numerical EXamination of Urban Smog), this method was applied to simulation of carbon monoxide in Los Angeles. For CO the NEXUS simulation was within 20% of observed day-averaged concentrations at 12 stations and the hour-averages were also in good agreement. This model was extended to include the effects of photochemical smog in Los Angeles. The results of the photochemical simulation were only qualitatively correct due to rapid nitric oxide to nitrogen dioxide conversion in the simulation. Due to the accuracy of advection with the PICK method, it may also make a significant contribution to hydrodynamic modeling for meteorological applications. (Author abstract modified)

23610 APTIC NO. 43336

Smith, Michael R. and Richard A. Johnson

APPLICATION OF AEROSPACE DATA ACQUISITION TECHNOLOGY TO ATMOSPHERIC AND METEOROLOGICAL INVESTIGATIONS. *Advan. Astronaut. Sci. Suppl., vol. 26:19-27, 1971. (Presented at the American Astronautical Society and the American Institute of Aeronautics and Astronautics, Special Technical Event, Winrock, Ark., Oct. 30, 1970, Paper AAS70- 076.)*

The Airborne Data Aquisition System (ADAS) represents a unique application of aerospace technology and excess hardware to problems in the environmental sciences. The development of the ADAS has provided an economical means of obtaining atmospheric and meteorological data using a light single engine aircraft. The outside sensors include a liquid water content pickup head, wet and dry bulb thermistors, and static and total pressure probes. The system can be installed in the aircraft and ground calibrated with less than 10 man-hours of effort. The maximum telemetry range of the ADAS is unknown; however, missions have been conducted as far as 100 mi from the ground receiver station and at altitudes of about 1000 ft MSL. The ADAS was designed primarily to acquire data related to the growth and dissipation of rocket exhaust plumes, which are generated during the static firing of the S-IC and S-II rocket engines. Investigations on the effect of various meteorological conditions on the structure of natural clouds were carried out in approximately the same manner as for the rocket exhaust clouds. Data processing procedures are described.

23611 APTIC NO. 42409

Steinmetz, H. J.

LAND UTILIZATION AND THE EFFECTS THEREOF ON ECOLOGY. *In: Lufthygienisch-meteorologische Modelluntersuchung in der Region Untermain. 3. Arbeitsbericht: Infrarot-Thermographie. Regionale Planungsgemeinschaft Untermain, Frankfurt am Main (West Germany), p. 10-13, March 1972.*

Cultivation by agriculture or forestry has been greatly modified or supplanted because of population growth, expanded use of countryside areas for leisure activities, inefficient agricultural conditions resulting in decreased agricultural land use, and heavy overburdening of the natural factors of air and water. The results of planned inflight infrared scanning are expected to answer many questions concerning the influence of type of vegetation on climate, air improvement, location, and biological changes within the air layer close to the ground, influence of type of vegetation on air exchange, and influence of vegetation on surface and underground water. From these studies perhaps a means of controlling the formation and flow of cold air can be developed.

23612 APTIC NO. 43256

Terjung, Werner H., Arthur W. Dakan, Robert N. Hawkins, Richard D. Hickey, Robert B. Howard, Ronald N. Kickert, Jack P. Ninwka, Simon O. Ojo, Gerald L. Potter, Stanley W. Swarts, and Stanton E. Tuller

THE ENERGY BALANCE CLIMATOLOGY OF A CITY-MAN SYSTEM. *Assoc. Amer. Geographers Ann., 60(3):466-492, Sept. 1970. 66 refs.*

The urban energy balance climatology of the city and man in the Los Angeles basin was examined during a cloudy day from sunrise to sunset, by measuring or estimating solar radiation, net radiation, ground heat flux, actual surface temperature, terrain radiant temperature, radiant sky temperature, and dry and wet-bulb temperature for the physical urban interface. An analogous theoretical model attempted to define the input of energy to the human interface via the solar heat load, and the disposal of human net radiation was shown via the channels of latent, sensible, and body heat flux. In spite of an apparent uniform cloud cover, the energy parameters had considerable areal variation in intensity and trend. During the daylight hours 70% of the solar radiation was absorbed; an additional 32% was removed by longwave radiation. Of the net radiation received on the dry surface (47% of solar radiation), about 80% was disposed via sensible heat flux, and the remainder entered the pavement as storage. Air temperatures taken at shelter height were out of phase with the ongoing energy regime and were of dubious value in urban climatic studies. Urban man received 37% and 70% of the values available at the horizontal pavement for solar radiation and net radiation, respectively. A series of empirical and theoretical models show high correlations with the observations. Solar radiation and net radiation (physical and human) can be estimated via the solar constant and appropriate transmissivities. (Author abstract modified)

23613 APTIC NO. 42720

Thomas, Robert W. L.

ON THE RELATIONSHIP BETWEEN AEROSOL CONTENT AND ERRORS IN TELEPHOTOMETER EXPERIMENTS. *Preprint, American Chemical Society, Washington, D. C.; American Institute of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Institute of Electrical and Electronic Engineers, New York; Instrument Society of American, New york; National Aeronautics and Space Administration, Washington, D. C.; National Oceanographic and Atmospheric Administration, Washington, D. C., 7p., 1971. 8 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1062.)*

An invariant imbedding theory of multiple scattering phenomena contributing to errors in telephotometer experiments is presented. The theory indicates that there is a simple relationship between the magnitudes of the errors introduced by successive orders of scattering and it is shown that for all optical thicknesses each order can be represented by a coefficient which depends on the field of view of the telescope and the properties of the scattering medium. The verification of the theory and the derivation of the coefficients has been accomplished by a Monte Carlo program. Both monodisperse and polydisperse systems of Mie scatterers have been treated. The results demonstrate that for a given optical thickness the coefficients increase strongly with the mean particle size particularly for the smaller fields of view. (Author abstract modified)

23614 APTIC NO. 42970

Tucker, Walter D. (ed.)

THE ATMOSPHERIC DIAGNOSTICS PROGRAM AT BROOKHAVEN NATIONAL LABORATORY: THIRD STATUS REPORT. *Brookhaven National Lab., Upton, N. Y., Radiation Div., Brookhaven National Lab., Upton, N. Y., Analytical Chemistry Group, and Brookhaven National Lab., Upton, N. Y., Meteorology Group, 49p., Dec. 1970. 15 refs.*

NTIS: BNL 50280

Development of the Isotope Ratio Tracer and sulfur hexafluoride tracer methods for studying the behavior of stack plumes and pollutant sulfur has continued. They are being applied to problems in the behavior of sulfur oxides in plumes and in the atmosphere. Facilities for flue gas sampling have been installed at several power stations to give different combinations of fuel type and type of terrain. Equipment has been developed and operated for isokinetic sampling of flue gas for sulfur oxides and for SF_6. An airborne optical densitometer has been used to track plumes by measurement of particulate densities and an airborne isokinetic sampler has made it possible to collect representative particles emitted from stacks for electron microscopy studies. A real-time gas chromatograph for tracking tracer SF_6 is under development. Oxidation of sulfur dioxide in stack plumes occurred to the extent of 10 to 20% over distances of up to 10 mi from a source. Kinetic considerations appear to favor a second-order reaction over a first-order, with a value for the rate constant of approximately 1/ppm/hr. (Author abstract)

23615 APTIC NO. 42797

Urone, Paul, William H. Schroeder, and Steven R. Miller

REACTIONS OF SULFUR DIOXIDE IN AIR. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 370-375. 28 refs. (Dec. 6-11, Paper CP 7B.)*

Sulfur dioxide in air is commonly considered to be oxidized to sulfate by two principal methods: photochemical and catalytic. The photochemical product is assumed to be sulfur trioxide which rapidly combines with water vapor to form sulfuric acid aerosols. The photochemical reaction rate of SO_2 in clean air is very slow, but it increases markedly in the presence of nitrogen oxides and hydrocarbons. Sulfur dioxide dissolves readily in water aerosols, and can be oxidized rapidly to H_2SO_4 by dissolved atmospheric oxygen if catalysts, such as the oxides or salts of iron or manganese, are present. The reaction is slowed considerably when the pH of the solution approaches 3, however if sufficient ammonia is present, the reaction may continue indefinitely. Large fractions of the atmospheric particles over large cities have been found to consist of ammonium sulfate. The reactions of SO_2 with hydrocarbons are puzzling; when the aerosols are analyzed the principal constituent is H_2SO_4. Studies were conducted to investigate the photochemical and thermal reactions of SO_2 with nitrogen dioxide. Since infrared spectrophotometry and gas chromatography were used to measure the SO_2 and NO_2, the minimum required concentrations were much higher than those encountered in air pollution. The reaction of SO_2 with a large excess of NO_2 in air showed an increase in the integrated reaction rate beyond 60 min and indicated the presence of an induced or secondary reaction. A stable, white, crystalline solid precipitated on the bottom walls of the flask, and appeared to form in the gas phase. Based on infrared spectrum and microchemical analyses, the compound was postulated to be nitrosylbisulfate. A mixture of 1000 ppm SO_2 and 1.50% NO_2 in dry air was stored in the dark at room temperature for two and one-half hours, irradiated for 15 min, and then kept in the dark at room temperature. The results of gas chromatographic analysis suggest that a photochemically induced reaction occurs in air to produce H_2SO_4 in a manner that is very similar to that of the lead chamber process. The proposed mechanism indicates that the thermal reaction rate of NO_2 with SO_2 consists of two terms: the reaction of NO_2 with itself to produce nitric oxide and oxygen and the reaction of NO_2 with SO_2 to produce SO_3 and NO.

23616 APTIC NO. 43593

Varney, Robert N. and Robert C. Gunton

PRODUCTION OF NO2 POSITIVE IONS IN AIR. *J. Geophys. Res. Space Phys., 74(7):1867-1869, April 1, 1969. 6 refs.*

Two independent experiments were conducted that disclose the formation of positive nitrogen dioxide ions in air in abundances that mark these ions as the principal ones present. Both studies were conducted at higher pressures than previous experiments, ranging from 0.01 to 2 torr, and both indicate a delay in the formation of the NO_2 positive ion, which may account for the absence of the ion at lower air pressures. In one experiment, a thoriated iridium filament was placed directly into air at pressures up to 2 torr. Thermionic electrons from the filament were accelerated to a grid 3 mm away by a potential of 0 to 30 volts. Ions produced beyond the grid by these electrons were driven by a small negative potential, relative to the first grid applied, to a second grid 3 mm farther from the filament. The ions then proceeded in the air for a total distance of 2.5 cm, through various grids to control their drift motions, and finally emerged through an aperture 0.010 in. in diameter into a high-vacuum region and a quadrupole mass spectrometer fitted with an electron multiplier detector. The NO2 positive ion appeared to be formed by at least two different mechanisms because of the appearance at 13.7 v and the increased rate of production above 19.8 v. Observations suggest that a reaction among excited neutral particles is involved. The decline in the relative abundance of NO2 positive ion with decreasing pressure, apparently approaching the zero level at ionospheric pressures, may well be associated with a limited life of intermediate metastables. In the second experiment, the NO2 positive ions dominated during the early afterglow in air ionized and dissociated by short microwave pulses at pressures near 0.5 torr. The NO2 positive ion may be formed by charge exchange of NO2 with the positive oxygen ion. The dominant negative NO2 ion may be formed by direct electron attachment to NO2. Further observations made at other pressures and pulse lengths revealed somewhat different results. The results of both experiments imply that the processes that lead to the formation of positive and negative ions of NO2 in air may need to be considered in quantitative descriptions of the lower ionosphere.

23617 APTIC NO. 43604

Viezee, William and John Oblanas

LIDAR-OBSERVED HAZE LAYERS ASSOCIATED WITH THERMAL STRUCTURE IN THE LOWER ATMOSPHERE. *J. Appl. Meteorol., 8(3):369-375, June 1969. 7 refs.*

Daytime observations of the vertical temperature and humidity structure in the atmosphere below 1 km made with a Cricketsonde rocket system are compared with simultaneous observations from a ruby lidar. Observations were made at a field site in Palo Alto, California, during August 1968 in the absence of low clouds when haze and pollution were visually evident. A direct relationship is observed between Cricketsonde and lidar data. Invariably, the temperature profile obtained by the Cricketsonde includes a subsidence inversion during the early morning. Either this inversion persists throughout the day or it is destroyed by surface heating, and the temperature lapse approaches the dry abiabat by midafternoon. The lidar observes a deep layer of particulate matter, the upper boundary of which rises in height from morning to afternoon. When a subsidence inversion is observed, the largest change in optical density is detected at the level of the inversion. However, concentrations of particulate matter are also observed by the lidar at higher livels. By monitoring the time change in intensity and in internal stratification of the aerosol layer, the lidar can follow the life cycle of the temperature inversion. (Author abstract modified)

23618 APTIC NO. 42410

Voelger, Klaus

PRINCIPLE AND METHOD OF INFRARED MEASURING FLIGHTS. *In: Lufthygienisch-meteorologische Modelluntersuchung in der Region Untermain. 3. Arbeitsbericht: Infrarot-Thermographie. Regionale Planungsgemeinschaft Untermain, Frankfurt am Main (West Germany), p. 13-18, March 1972.*

To measure temperatures in the environment, the wavelengths ranging from 2 to 13 micron (thermal infrared) are an obvious choice for both technical and energy reasons, particularly because the atmosphere in this range is especially penetrable. To measure such radiation, semi-conductor detectors of great efficiency and of sufficiently fast response are available. Inflight scanning is performed by an infrared-optical system which rotates at 16 rev/ sec; this system transmits received radiation to an infrared sensitive detector. For the range of 2-5.5 micron, this is an indium-antimonide cell. The temperature distribution along a line on the surface of the ground is reflected as a thermal profile on the screen of a cathode ray tube. Measuring in the 8-13 micron window should be advantageous for daylight flights. For night flights, the wavelength used is not as critical. The required tolerance in flight axis of plus or minus 100 m was maintained even in complete darkness. Many interfering factors must be allowed for and eliminated before a definite assessment can be made of infrared measurement as a research tool.

23619 APTIC NO. 43370

Westenberg, A. A.

CARBON MONOXIDE AND NITRIC OXIDE CONSUMPTION IN POLLUTED AIR: THE CARBON MONOXIDE-HYDROPEROXYL REACTION. *Science, 177(4045):255-256, July 21, 1972. 7 refs.*

A recent laboratory measurement of the ratio of the rate constant for the carbon monoxide-hydroperoxyl reaction relative to that for the hydrogen-hydroperoxyl reaction indicates that the former reaction is probably faster than the CO-OH reaction. On this basis a simple analysis is given showing that the calculated lifetime of nitric oxide in polluted atmospheres would be appreciably longer than that estimated on the assumption that the CO-HO2 reaction may be neglected. A fast CO-HO2 reaction implies that the cyclic consumption of CO (an atmospheric sink) could occur even with no NO present. (Author abstract modified)

23620 APTIC NO. 43178

Wigley, T. M. L.

CHARACTERISTICS OF WET PLUMES. *Preprint, American Meteorological Society, Boston, Mass. and Air Pollution Control Assoc., Pittsburgh Pa., 4p., 1971. 7 refs. (Presented at the Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-7, 1971.)*

An investigation of moist plume dynamics was performed in an effort to better evaluate the use of scrubbing techniques for the removal of water-soluble gases and particulate matter from gaseous industrial wastes. Moist plumes, plumes which contain moisture in the gaseous and/or liquid phases, are distinguished as uncondensed (containing no liquid water) and condensed (containing both liquid water and water vapor); the term wet plume is reserved for the condensed section. The transition to the wet stage is the most striking feature of the behavior of moist plumes. Just as the thermodynamics of dry air may be extended to cover moist (unsaturated) air, so moist (uncondensed) plume behavior may be derived from dry plume theory by the simple transformation of all temperatures to virtual temperatures. The behavior of bent-over moist plumes is determined by equations similar to those which have been applied to dry plumes. Mathematical expressions are developed which determine whether or not condensation will occur, and, if so, the point of condensation. It is predicted that condensation, if it does occur, must do so close to the stack, a prediction which is confirmed by experimental observations.

23621 APTIC NO. 43424

Wilkniss, Peter E. and David J. Bressan

GEOCHEMICAL ASPECTS OF INORGANIC AEROSOLS NEAR THE OCEAN-ATMOSPHERE INTERFACE. *Am. Chem. Soc., Div. Water, Air Waste Chem. Gen. Paper, 11(2):156-158, Sept. 1971. 14 refs.*

Aerosol samples collected over the oceans near the air-sea interface were analyzed. Efforts were directed toward the determination of metals such as sodium, magnesium, aluminum, titanium, vanadium, manganese, scandium, iron, cobalt, antimony, cerium, and europium by neutron activation analysis, and of fluorine and chlorine by photon activation. Atomic absorption spectroscopy was used to determine sodium, potassium, iron, and manganese. The fluoride ion-specific electrode was used to determine fluoride in seawater, sea spray, and rainwater. Comparison of the elemental ratios for Ce/Fe, Sc/Fe, Co/Fe, and Eu/Fe with those of other investigators showed good agreement. Comparison of results obtained from the Indian Ocean for Al/Fe and Mn/Fe with the present results for same elemental ratios over the Atlantic agree satisfactorily. Comparison of these results with average elemental ratios found in seawater and in crustal rocks shows that the source of the trace metals is the continents rather than the ocean. The elemental ratios for Sc/F, Fe/F, Na/F, and Ti/F differ by several orders of magnitude for seawater and average crustal rocks. These ratios were determined in Atlantic aerosols and indicate that the continents are the source of these trace metals. Fluoride concentrations are an excellent indicator of a marine aerosol. The results for inland rain compare well with the same elemental ratios determined over land in aerosols near the east coast of the U. S. In coastal areas aerosols rapidly change to continental characteristics.

BASIC SCIENCE AND TECHNOLOGY

23622 APTIC NO. 43517

DESCRIPTION OF PROCESSES FOR TREATMENT OF COPPER MINERALS. *(Descripcion de los procesos de tratamiento de los minerales de cobre). 1971 (?). Translated from Spanish. 32p.*

The lixiviation of copper oxides and flotation processes for copper sulfides are described. In lixiviation, copper is extracted from crushed minerals by taking advantage of its solubility in some type of solution such as sulfuric acid. The mineral can be lixiviated in the mine or in open pits. Lixiviation is accomplished by percolation or by agitating the fine-ground mineral with the lixiciating agent. Flotation is the process of concentration which permits the recovery of useful minerals from an ore composed of different materials, and is based on the properties of sulfurous minerals of copper, which permit the adherence of particles of the sulfurous minerals to air bubbles when the mineral is mixed in a water pulp and air is made to bubble from the bottom of the receptacle.

23623 APTIC NO. 42895

Adams, D. L. and L. H. Germer

ADSORPTION OF CARBON MONOXIDE ON TUNGSTEN (210). *Surface Sci., 32(1):205-221, July 1972. 25 refs.*

Thermal desorption spectra taken after adsorption of carbon monoxide at room temperature on tungsten (210) show sequential formation with increasing coverage of strongly bound beta-2 and beta-1 binding states, correlated to the sequential formation of P(2 times 1) and (1 times1) adsorbate structures as observed by LEED. Adsorption at room temperature gives a poorly ordered arrangement of adsorbed CO molecules, but well-ordered structures are produced by subsequent anneal. For adsorption without anneal, the work function increases monotonically with coverage to a maximum of delta phi equals 0.7 eV at saturation coverage of one monolayer. For adsorption followed by anneal, the work function dependence on coverage is less simple, with even a decrease of work function at coverages less than a quarter monolayer. LEED intensity-voltage measurements from P(2 times 1)- CO and P(2 times 1)-N structures suggest that CO molecules occupy the sites of 4-fold symmetry upon which nitrogen is believed to be adsorbed. The distinction between the beta-2 and beta-1 states of adsorbed CO is attributed to heterogeneity induced by the reduction in binding energy of a CO molecule when its nearest neighbor sites are occupied. (Author abstract modified)

23624 APTIC NO. 43578

Albert, D. Kendall and Lawrence Granatelli

DETERMINATION OF MICROGRAM QUANTITIES OF ARSENIC IN NAPHTHAS WITH OXYHYDROGEN BURNER. *Anal. Chem., 31(9):1593-1596, Sept. 1959. 8 refs. (Presented at the American Chemical Society, Division of Petroleum Chemistry, Meeting, 135th, Boston, Mass., April 1959.)*

Arsenic in naphthas is determined at the ppb concentration level by combustion of the sample in the flame of a Beckman oxyhydrogen burner. Products of combustion are absorbed in sodium hydroxide solution. Arsenic in the sodium hydroxide solution is converted to arsine and determined spectrophotometrically with silver diethyldithiocarbamate in pyridine. Naphtha, desulfurized over cobalt molybdate catalyst, was used as the base stock. Analyses of the naphtha indicated an arsenic content between zero and one ppb. Using this method the standard deviation varied from about 1 ppb at the 8 ppb level to about 4 ppb at the 78 ppb level. Average recoveries within the 8 and 78 ppb range varied from 88 to 94%. Limited analyses at the 2 ppb level indicated a relative error of about 50% or greater at that level. The lower limit of the method is approximately 2 ppb. Samples were burned at an average rate of 80 g/hr, with most sample sizes varying within the range of 50 to 200 g. Samples larger than 200 g were burned by recharging the sample holder. The main advantage of the combustion apparatus is that a relatively small amount of water of combustion is accumulated in the absorber, thus reducing the evaporation time in preparing the absorber solution for analysis.

23625 APTIC NO. 42939

Amos, M. D. and J. B. Willis

USE OF HIGH-TEMPERATURE PRE-MIXED FLAMES IN ATOMIC ABSORPTION SPECTROSCOPY. *Spectrochim. Acta, vol. 22:1325-1343, 1966. 26 refs.*

Pre-mixed flames having temperatures of about 2900 C may be produced by burning acetylene with nitrous oxide or with oxygen-nitrogen mixtures. The performance of both types of flame in the atomization of metals for atomic absorption spectroscopy is fairly similar, though the acetylene-nitrous oxide mixture is more convenient and can be burned with greater safety at a long burner. The new flames allow the addition of some 25 metals to the list of those that can be determined by atomic absorption spectroscopy. They possess the further advantage that they permit the determination of metals such as calcium, strontium, barium, and molybdenum, which are only partially atomized in cooler flames, with higher sensitivity and greater freedom from chemical interference. The effect of flame length is discussed, as well as sensitivities for refractory metals, borderline elements, and interferences. (Author abstract modified)

23626 APTIC NO. 42822

Anderson, Bernhard H.

FACTORS WHICH INFLUENCE THE ANALYSIS AND DESIGN OF EJECTOR NOZZLES. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 7p., 1972, 13 refs. (Presented at the American Institute of Aeronautics and Astronautics Aerospace Sciences Meeting, 10th, San Diego, Calif., Jan. 17-19, 1972, Paper 72-46.)*

A theoretical analysis of the viscous interaction between the primary and secondary streams of ejector nozzles was developed. The analysis accounts for real sonic-line effects and the streamwise variation in stream mixing and boundary layer within the ejector. The aspects of the analysis are explained and illustrated by applying the theory to a variety of ejector configurations including cylindrical shroud, contoured flap, and plug nozzles. Both primary nozzle inlet flow conditions and pointwise mixing between the two streams strongly influence the pumping and thrust characteristics of ejector nozzles. When the secondary inlet Mach number becomes high, the pumping characteristics can be noticeably affected by boundary layer flow blockage. Reasonable agreement can be achieved in predicting ejector performance with primary inlet temperatures up to 3500 deg R provided the secondary inlet temperature is known. High primary nozzle inlet temperatures strongly effect ejector pumping characteristics, while giving only marginal gains in thrust efficiency if the ejector is operating at optimum conditions. Design variables including diameter ratio, spacing ratio, total temperature ratio, and primary nozzle geometry are discussed.

23627 APTIC NO. 42894

Andrew, R. and E. M. Williams

IMAGE GAS ENHANCEMENT OF THE FIELD DESORPTION OF CARBON MONOXIDE IN A FIELD ION MICROSCOPE. *Surface Sci., 32(1):157-167, July 1972. 17 refs.*

The enhancement by helium gas of the field desorption of carbon monoxide in a field ion microscope has been investigated for saturated and partial layers formed at 78 K. Measurements are reported over a range of values of desorbing field, and show that the image gas promotes desorption everywhere at lower field, and also that desorption in the presence of image gas occurs over a much greater range of field than in vacuum. The implication is that the enhancement energy provided by the image gas decreases with increasing field, which is difficult to reconcile with the conventional models whereby promoted desorption is attributed to electron impact by electrons formed in the field ionization process or to impact by polarized helium atoms. An explanation is proposed in terms of the formation of an image gas-absorbate complex. (Author abstract modified)

23628 APTIC NO. 43143

Andrew, S. P. S. and D. Hanson

THE DYNAMICS OF NITROUS GAS ABSORPTION. DI. *Chem. Eng. Sci., vol. 14:105-114, 1961. 10 refs.*

The theoretical rate equations have been derived for the important mechanisms leading to the absorption of nitrous gases into water on a sieve plate. Numerical agreement between the measured performance of a sieve plate, operating at 25 C, and the performance calculated from the theoretical rate equations is good. At high gas concentrations where the concentration of nitric dioxide is greater than 5.0 times 10 to the minus 7th power g mole/cu cm, the predominant absorption mechanism is the solution of nitrogen tetroxide in the liquid accompanied by its rapid hydrolysis to nitric acid and nitrous acid. This mechanism has been noted by previous workers, employing laminar flow absorption units. At low gas concentrations where the concentration of nitrogen dioxide is less than 0.5 times 10 to the minus 7th power g mole/cu cm, the predominant absorption mechanism depends on the ratio of the concentration of nitric oxide to the concentration of NO2 in the gas phase. When the concentration of NO divided by the concentration of NO2 is less than 0.5, the predominant mechanism is the liquid film limited solution of NO2. When this same ratio is greater than 5, the predominant mechanism is the absorption of nitrous acid followed by its homogeneous liquid phase decomposition. At all intermediate concentrations, more than one absorption mechanism is of importance in determining the total absorption rate of NO2 into water.

23629 APTIC NO. 42321

Aston, John G.

GAS-FILLED HOLLOW DROPS IN AEROSOLS. *J. Colloid Interface Sci., 38(2):547-553, Feb. 1972. 13 refs.*

The generalized equations for the tension and negative pressure in an envelope of fluid filled with an inert gas under pressure are given. These equations can be used to derive Kelvin's now classical equations for the tension of a fluid at its equilibrium height in a capillary. A statisfactory theory of cloud formation is obtained when these equations are applied to the condensation of water in air filled hollow drops. An abbreviated double entry table is given for the tension in metastable air filled hollow drops as they fall from the original height of formation. This table can be used to estimate the relative density of drops of various sizes in the clouds as a function of altitude. Equations for the air filled water drop are used to calculate summit temperatures and summit heights of cumulus clouds as well as the probable height of the base. These calculations are shown to be in agreement with relevant exploratory observations. (Author abstract modified)

23630 APTIC NO. 42982

Bakanov, S. P. and B. V. Derjaguin

THE MOTION OF A SMALL PARTICLE IN A NON-UNIFORM GAS MIXTURE. *Faraday Soc. Discussions, no. 30:130-138, 1960. 12 refs.*

The problem of the behavior of a small aerosol particle (smaller than the mean free path of gaseous molecules) in a non-uniformly heated gas mixture is examined on the basis of the Chapman Enskog method. The velocity at which the particle moves through such a mixture is calculated. A numerical computation is made for a carbon tetrachloride plus helium mixture. Inversion of the particle velocity is observed, i.e., the particle may be attracted to an evaporating drop and repelled from a growing one. By way of particular cases the velocity of motion is found for a particle in an isothermal binary mixture and in a simple non-uniformly heated gas. (Author abstract)

23631 APTIC NO. 43131

Barbieri, R., S. Rossi, and A. Bucca

INVESTIGATIONS OF THE REACTION H2S PLUS SO2. ANALYTICAL PROCEDURES FOR SEPARATING AND BREAKING DOWN MACROQUANTITIES OF SULFUR COMPONENTS IN RESEARCH WITH S35. *(Indagini sulla reazione H2S + SO2. Procedimenti analitici di separazione e demolizione di macroquantita di composti solforati in indagini con S35). Ric. Sci., no. 10:1509-1517, Oct. 1960. 15 refs. Translated from Italian. Translation Consultants, Inc., Arlington, Va., 15p.*

Methods developed for the fractionation of polythionic acids to obtain various solutions of sulfur ions corresponding to the two types of sulfur atoms contained in the molecule of polythionic acid are reviewed. The single components were separated using paper chromatography. The reaction between sulfur dioxide and hydrogen sulfide was studied. Experimental procedures, solvent efficiency, and test reactions and results are discussed. The modalities for obtaining measurable quantities of the indicated substances were also determined.

23632 APTIC NO. 43132

Barbieri, R. and S. Sosi

ON THE REACTION OF H2S AND SO2: THE INFLUENCE OF EXPERIMENTAL CONDITIONS ON THE MECHANISM OF THE FORMATION OF H2SXO6 AND H2S2O3. *(Sulle reazioni di H2S con SO2: Influenza delle condizioni sperimentali sul maccanismo di formazione di H2SxO6 e H2S2O3). 1961. 9 refs. Translated from Italian. Translation Consultants, Inc., Arlington, Va., 12p.*

The Wackenroder reaction mechanism of hydrogen sulfide and sulfur dioxide using S35 was investigated to determine the influence of experimental conditions on the mechanism of the formation of thionic acid and thiosulfuric acid. Sulfur atoms with an oxidation number of 6 in SxO6(2-), synthesized by the Wackenroder reaction, were fully formed from the sulfur in SO2; those with an oxidation number of 2 were formed from the sulfur in both reagents. The reaction of H2S diluted by highly excessive quantities of an inert gas caused the sulfur atoms with an oxidation number of 2 in SxO6(2-) to form approximately 50% from the sulfur in H2S and 50% from the sulfur in sulfur dioxide with no variations in reaction correlated with variations in temperature, acidity of reactants, or nature of the dilutant gas. The elemental sulfur originating from the Wackenroder reaction in this way always formed approximately 66% from the S2S and 33% from the SO2. For H2S reactions with a dilute solution of SO2 in water (5-20 mg/ml), the sulfur atoms with an oxidation number of 2 in S2O3(2-): S2O3(2-) equals S3O6(2-):SxO6(2-) and the elemental sulfur formed approximately 33% from the sulfur in the SO2 and 66% from that in H2S. (Author summary modified)

23633 APTIC NO. 43144

Bauer, William H.

TECHNICAL ASPECTS OF FUSION FORMING OF FLY ASH CERAMIC STRUCTURES. *Bureau of Mines Information Circ. 8488, 1970:77-82, 1970. 6 refs. (Presented at the Ash Utilization Symposium, 2nd, Pittsburgh, Pa., March 10-11, 1970.)*

Fused-cast objects from fly ash mixtures are characterized by high densities, excellent resistance to corrosion and abrasion, and good high-temperature stability. Poor structural soundness, particularly in the relatively pure crystalline castings, has been a limiting factor. In the present studies, two approaches were taken. Fly ash was evaluated as a raw material for a high temperature glass which would be formed with conventional glass techniques. Secondly, the development of glass ceramics evolving from controlled nucleation and crystal growth within a solidified glass was considered. To attain the relatively high temperatures needed to produce melts fluid enough for casting, several laboratory arc melting furnaces were developed and a number of electrode configurations and container shapes were evaluated. Similar Russian work with stone castings is reported.

23634 APTIC NO. 42814

Bieber, Albert George

ABSORPTION OF A GAS INTO A LIQUID IN TURBULENT OPEN CHANNEL FLOW. *Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Chemical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1971, 184p. 71 refs.*

The relationship of the time of contact to the Froude number, Reynolds number, and geometry of the channel was studied for the transfer of a slightly soluble, pure gas into a liquid in turbulent open channel flow. The absorption of carbon dioxide by water provided the means to relate time of contact of the penetration theory to the operating conditions; absorption by 0.085 molar aqueous sodium hydroxide solution at the same operating conditions provided a check against the penetration theory predictions. Apparatus consisted of a plexiglas open channel, with associated equipment for preparing and pumping the solution and supplying the carbon dioxide gas to the channel. As the Reynolds number was increased the absorption rate approached an upper limit which was achieved at a Reynolds number of 24,000. The absorption rate in a given channel width was governed primarily by the Froude and Reynolds numbers. A significant buildup of a nearly immobile surface film occurred within the absorption section during the absorption tests. The rate of absorption per unit area by the film covered area was independent of the flow conditions, was a maximum when the film first started accumulating, and decreased linearly as the film length increased. The times of contact ranged from about 1-70 sec with most of the results being in the range 1-5 sec. At these times of contact the film theory would seem to be more appropriate than the penetration theory. (Author abstract modified)

23635 APTIC NO. 42826

Blazowski, W. S., R. B. Cole, and R. F. McAlevy, III

EFFECTIVE HEATS OF GASIFICATION OF POLYMERS UNDER COMBUSTION CONDITIONS. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 14p., 1972. 39 refs. (Presented at the American Institute of Aeronautics and Astronautics Aerospace Sciences Meeting, 10th, San Diego, Calif., Jan. 17-19, 1972, Paper 72-34.)*

Values of effective heats of gasification of combusting polymers were obtained for the first time. Various polymers were burned with an impinging oxygen jet in a well-controlled diffusion flame. The polymers included polymethylmethacrylate (PMM), Plexiglas-55, polyethylene, polypropylene, Delrin, nylon 6-6, and ICRPG polyurethane. A realistic model was developed to deduce values for effective heats of gasification from correlations of surface regression rate and oxygen impingement-rate data. The model involves a boundary-layer analysis accounting for compressibility and pressure gradients and assuming a unity Lewis number and a constant Prandtl number throughout the flow field. The effective heat of gasification enters the model as a surface energy boundary condition which, in the present case, has been calculated. Results are compared with values from other surface-heating and bulk decomposition experiments, but lack of test-specimen standardization among laboratories undermines the validity of comparisons and of conclusions based on them. (Author abstract modified)

23636 APTIC NO. 43428

Bracco, Frediano V.

NITRIC OXIDE FORMATION IN DROPLET DIFFUSION FLAMES. *Preprint, 28p., 1972, 7 refs. (Presented at the International Symposium on Combustion, 14th, University Park, Pa., Aug. 20-25, 1972.)*

Results of a study of nitric oxide formation in ethanol droplet spherical diffusion flames are presented. The Zeldovich chemical kinetic mechanism for NO formation was utilized together with the standard equations for the diffusion flame. It was concluded that diffusion flames around hydrocarbon fuel drops burning in high temperature air could be significant sources of NO. It was also found that NO diffusion must be considered to calculate properly its concentration, that the mass of NO produced/unit mass of fuel burned increased with the droplet radius, that finer fuel sprays produced less NO than coarse ones, and that fuel-bound nitrogen significantly enhanced production of nitric oxide at lower air temperatures. (Author abstract modified)

23637 APTIC NO. 42820

Bratis, J. C. and J. L. Novotny

RADIATION-CONVECTION INTERACTION IN REAL GASES. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 8p., 1972. 21 refs. (Presented at the American Institute of Aeronautics and Astronautics Aerospace Thermophysics Conference, 7th, San Antonio, Tex., April 10-12, 1972, Paper 72-27F.)*

The effect of an absorbing-emitting gas in a laminar free- convection boundary layer on a perfectly-reflecting vertical plate is examined. The exponential wide-band model of Edwards and Menard for the total band absorptance is used in the analysis for formulating the radiation term in the energy equation. The method of solution is based on a regular perturbation expansion from the free convection solution without radiation. The limits of large and small absorbing gas pressures are taken giving different expressions for the band absorption formulation. Results are presented for pure ammonia and nitrous oxide for a range of pressures as well as for mixtures of NH3-nitrogen and N2O-N2 for different total pressures.

23638 APTIC NO. 42858

Bruckner, A. P. and R. G. Jahn

EXHAUST PLUME STRUCTURE IN A QUASI-STEADY MPD ARC. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 12p., 1972. 21 refs. (Presented at the American Institute of Aeronautics and Astronautics Electric Propulsion Conference, 9th, Bethesda, Md., April 17-19, 1972, Paper 72-499.)*

Spectroscopic and photographic investigations reveal a complex azimuthal species structure in the exhaust plume of a quasi-steady argon MPD (magnetoplasmodynamic) arc. Over a wide range of operating conditions the injected argon remains collimated in discrete jets which are azimuthally in line with the six propellant injector orifices. The regions between these argon jets, including the central core of the exhaust flow, are occupied by impurities ablated from the Plexiglas chamber end plate. The features of this plume structure are dependent on the arc current and mass flow rate. Time-resolved spectroscopic velocity measurements, obtained by a scanning Fabry-Perot interferometer, indicate argon ion jet velocities of 16,500 m/sec at a current of 16 kA and a matched mass flow of 6 g/sec. Nearly half this velocity is attained in an acceleration region well downstream of the region of significant electromagnetic interaction. Temperature measurements suggest that simple expansion processes in the argon jets cannot fully explain the observed acceleration. It is possible that a transfer of momentum from the ablated core flow to the argon jets may contribute to the high argon velocities. (Author abstract modified)

23639 APTIC NO. 42719

Caro, J. H., H. E. Batson, Jr., and L. J. Clark

COMPOSITION AND FERTILIZER POTENTIAL OF PRECIPITATOR DUSTS FROM PHOSPHATE SMELTING FURNACES. *J. Assoc. Offic. Agr. Chem., 41(3): 649-654, 195[illegible] [illegible]8 refs. (Presented at the Association of Official Agricultural Chemists, Annual Meeting, 71st, Washington, D. C., Oct. 14-16, 1957.)*

Eighteen samples of precipitator dust (potash-phosphate ash) representing by-products of nine plants engaged in the manufacture of electrothermal phosphorus were analyzed for constituents important from an agricultural standpoint. All samples contained notable amounts of available phosphorus and soluble potassium. As a class, dusts derived from western U. S. phosphate rock compared favorably with those derived from Florida or Tennessee rock. The former group supplied more high-quality phosphorus, and more soluble potash, than the other two classes. Dusts from Florida rock appeared to be inferior to the others, especially with respect to the relatively low supply of potash. A handicap in the use of precipitator dusts in fertilizer trade is the variability in composition of products from individual plants. Analyses indicated that total phosphorus of test samples from the same plant can vary by as much as 35% and soluble potash by over 50%. High variability was also found for most of the other analyzer constituents. The dusts carried generous percentages of calcium and zinc, the latter predominantly in Western products. Copper, molybdenum, and cobalt were also found in more than trace quantities. It was concluded that precipitator dusts from phosphorus furnaces can be used as fertilizer materials. (Author summary modified)

23640 APTIC NO. 43151

Chopra, S. K. and S. N. Narain

MEASUREMENT OF THE SPECIFIC SURFACE OF FLY ASH. *Mater. Res. Std., 4(9):487-490, Sept. 1964. 11 refs.*

The Blaine air permeability method for finding the specific surface of fine material gives misleading information about the fineness of fly ashes, particularly those which are comparatively coarse and contain a high content of unburned fuel. A modification of the current procedure, involving separation of the coarse fraction and unburned fuel to overcome the problem of inhomogeneity of the powder bed, is described. The measurements of fineness obtained by this modified procedure appear to be reliable, as the specific surface obtained bears a constant relationship to that obtained with the Wagner Turbidimeter. (Author conclusions modified)

23641 APTIC NO. 42459

Cipolla, Richard Gennaro

23642 APTIC NO. 42827

Clark, E. L., G. E. Kelly, and W. W. Perkowski

AEROSOLS OF ATMOSPHERIC PARTICULATE AND ORGANIC POLLUTANTS. *International union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 428-431. 9 refs. (Dec. 6-11, Paper CP 19D.)*

A method for the preparation of aerosols of inorganic and organic air pollutants of known particle size and concentration was developed. These aerosols will be utilized to provide a means of subjecting test animals to atmospheres containing predetermined quantities of pollutants in aerosol form. An important restriction on the aerosol system was to avoid any material as a solvent or suspending fluid which might adversely affect test animals which would be exposed to the aerosol. The possibility of utilizing techniques without solvent or suspending fluid was considered for the specific case of iron oxide. Two widely used pigments, both Hematite, Fe203, were used for the tests. The tests were conducted in the following manner: A slurry containing a known percentage of iron oxide was prepared and placed in a glass jar. The atomizer was inserted and the slurry swirled to mix the ingredients. Air flow was initiated, and the turbulence of the atomizer maintained a uniform slurry. The aerosol was then conducted to a stainless steel tube containing two sampling connections. These were separated by a distance of 30 in. so that some evidence of any particulate settling could be observed. The atomizing system was suitable for use with slurries. However, the need for control of slurry mixing was obvious to maintain uniformity. Accordingly, controlled stirring was incorporated into the atomizing container. An improved technique of adding organic pollutants was also evolved. This consisted of slowly adding a calibrated ether solution of the organics to a heated, and vigorously stirring the water slurry containing the desired amount of iron oxide. The slurry was kept above the boiling point of the ethyl ether used. Rapid vaporization of the ether resulted in the formation of very fine particulates of organic matter which seemed to be well intermixed with the iron oxide. A few tests were made with ethanol.

23643 APTIC NO. 43292

Cusumano, J. A. and M. J. D. Low

INTERACTIONS BETWEEN SURFACE HYDROXYL GROUPS AND ADSORBED MOLECULES. IV. BENZENE ADSORPTION ON GERMANIA. *Preprint, New York Univ., N. Y., Dept of Chemistry, 24p., 1971 (?). 11 refs.*

Isotherms of benzene adsorption on germanium oxide which has been dehydroxylated to various extents were measured with a recording vacuum microbalance. Infrared spectra were recorded of adsorbed benzene and the perturbations of surface Ge-OH groups were studied. Heats of adsorption and entropies derived from the data were compared with theortical values computed for mobile and immobie adsorption. The thermodynamic and infrared data indicate the existence of capillary condensation as well as two specific adsorbent adsorbate interactions. One of these involves an interaction of the pi-system of adsorbed benzene with the surface Ge-OH groups; the second is the chemisorption of benzene on surface germanium atoms, the latter acting as Lewis acid sites. Adsorbed benzene is immobile at low coverages, and becomes mobile at higher coverages. The surface mobility and rotation of adsorbed benzene is discussed. (Author abstract modified)

23644 APTIC NO. 43419

Cusumano, J. A. and M. J. D. Low

INTERACTION BETWEEN SURFACE HYDROXYL GROUPS AND ADSORBED MOLECULES. III. THE NATURE OF THE ADSORBATE-HYDROXYL INTERACTION. *Preprint, Esso Research and Engineering Co., Linden, N. J. and New York Univ., N. Y., Dept of Chemistry, 33p., 1970 (?). 20 refs.*

Adsorption of a variety of substances on porous glass was studied in order to gain information about the nature of the interaction between aromatic molecules and surface hydroxyl groups. An analysis of the possible modes of interaction between benzenes and substituted benzene with surface hydroxyl groups pointed to the occurrence of charge transfer processes. Consequently, Mulliken-Puranik charge transfer theory was applied to the systems. For a pi-OH interaction, the model involves the formation of an asymmetrically bonded surface complex, an electron entering the antibonding orbital of the surface hydroxyl, interaction occurring between that orbital and the aromatic pi-system along one of the carbon-carbon lengths. Charge transfer theory led to the relations between the shift of the hydroxyl absorption frequency and the ionization potential of the adsorbate, as well as between the hydroxyl absorption frequency and the change in the hydroxyl absorption intensity, brought about by the adsorbate-OH interaction. An analysis of adsorption data showed that the charge transfer theory was quite successful in explaining the interactions of surface hydroxyls not only with aromatics but with a large variety of other adsorbents. (Author abstract modified)

23645 APTIC NO. 43679

Dryer F., D. Naegeli, and I. Glassman

HIGH TEMPERATURE OXIDATION REACTIONS OF CARBON MONOXIDE. *Preprint, Combustion Inst., Western States Sect., 26 p., Oct. 1971. 35 refs. (Presented at the Combustion Institute, Western States Section, Fall Meeting, Irvine, Calif., Oct. 1971, Paper 71-36.)*

Results of recent kinetic studies, concerning the reaction of carbon monoxide and methane with hydroxyl radicals, are presented. The temperature dependence of the reaction was determined by using the high and low temperature results very well, and indicates that the strong temperature dependence found in flame and shock tube experiments is more valid than previously expected. Above 150K hydrocarbon combustion probably follows a one-step, reactants-to- products procedure, with regard to thermal release; it is not likely that the moisture content radical plays a role in carbon monoxide conversion, but that methane and hydroxyl may not be the only route for methane conversion. (Author abstract modified)

23646 APTIC NO. 43146

Eriksson, Erik

COMPOSITION OF ATMOSPHERIC PRECIPITATION; I. NITROGEN COMPOUNDS. *Tellus (Uppsala), vol. 4:215-232, 1952.*

A survey of published data on the chemical analysis of atmospheric precipitation is presented; the different cycles proposed for nitrogen compounds in atmospheric precipitation are discussed. Most of the investigations conducted on rainwater concern nitrogen compounds. Total nitrogen, as ammonia and nitrate, shows a wide variation in rainwater; there is a fairly marked minimum level of around 1.9 kg nitrogen/ha and yr, and this value is probably the smallest amount which is brought down by precipitation. The variation in maximum nitrogen amount tends to be proportional to the amount of precipitation, or the maximum concentration of nitrogen is independent of the annual amount of rainfall. The proportions of ammonia to nitrate nitrogen in rainwater were investigated, and the data indicated that tropical rains contain a higher percentage of nitrate nitrogen than non-tropical. Those forms of precipitate which are derived from near the soil surface, as a rule, are much richer in ammonia than ordinary rainwater; it has also been ovserved that a very fine rain has a higher ammonia content than ordinary rain. The results of several studies indicate that the only net source of ammonia in air is the ammonia released on combustion of fossil fuels.

23647 APTIC NO. 42861

Facy, L.

SIMULATION IN WATER MODEL OF THE EFFECT OF THE RELIEF ON THE DIFFUSION OF EFFLUVIUM (COLORIMETRIC AND QUANTITATIVE EVALUATION). *(Simulation en veine hydraulique de l action du relief sur la des effluents (methode colorimetrique quantitative). Text in French. International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1004-1006. 1 ref. (Dec. 6-11.)*

A water model suitable for the quantitative colorimetric evaluation under adiabatic conditions and at a given diffusion rate of the effect of the relief on the diffusion of pollutants from point sources is described. Meteorological conditions are simulated in the model built usually in the scale of 1/10,000. Wind speeds are reproducible in a range of 1-30 m/sec. Temperature inversions are simulated by means of a horizontal polyethylene film, and the flow rate of the mixture of hydrochloric acid and ethanol, emitted from a precisely reproduced stack, is controlled with high precision. The sensitive emulsion, made of 3 prime, 3 double prime, 5 prime, 5 double prime-tetrabromo-m-cresolsulfophthalein and dimethylamino- 4-azobenzene, is treated with ammoniacal solution for stable coloration and protected by a semipermeable membrane. Lines of identical concentration are determined from lines with identical coloration, while the latter is dependent of the pH-value. The hydraulic model has been successfully applied to preliminary studies for space and city planning.

23648 APTIC NO. 42767

Fleet, B., K. V. Liberty, and T. S. West

A STUDY OF SOME MATRIX EFFECTS IN THE DETERMINATION OF BERYLLIUM BY ATOMIC-ABSORPTION SPECTROSCOPY IN THE NITROUS OXIDE-ACETYLENE FLAME. *Talanta, 17(3):203-210, March 1970. 13 refs.*

A number on interferences observed in the trace determination of beryllium by atomic absorption spectroscopy in the nitrous oxide acetylene flame were investigated. The major negative interference caused by the presence of an excess of aluminum salts may be overcome by the use of 8-hydroxyquinoline. Magnesium and silicon also depress the Be signal, but most other metals cause enhancement. In most instances the enhancements may be made uniform by the addition of potassium ions to the sample solution. The enhancement effects observed cannot be accounted for by ionization suppression or ascribed to any other single phenomenon. In all cases, both physical and chemical interactions occur which may be additive or substractive. The theories of chemical releasing and complexation reactions, of oxygen competition and chemical change of the flame conditions, of spatial distribution in the flame and nebulization effects must all be considered and it is, therefore, extremely difficult, if not impossible, to attempt accurate prediction of an interference effect. (Author abstract modified)

23649 APTIC NO. 43245

Fong, Clifford W. and William Kitching

SULFUR DIOXIDE INSERTION INTO CARBON-LEAD BONDS. *J. Organometal. Chem., 21(2):365-375, Feb. 1970. 20 refs.*

The insertion of sulfur dioxide into a variety of carbon-lead systems was studied to establish rigorously the O or S-sulfinato nature of the insertion product and the coordination about lead; provide data on relative rates and sites of insertion with various organic groups attached to lead; and demonstrate rearrangements accompanying the insertion. Spectroscopic and molecular weight data strongly suggested the presence of bridging (SO2) and essentially planar R-3Pb moieties. Relative rates of insertion into a number of differing R-Pb bonds were completely in line with an electrophilic cleavage description of the insertion process. Differences from and similarities with the behavior of analogous organotin systems were rationalized. (Author summary modified)

23650 APTIC NO. 42642

Fox, Douglas G.

THE NUMERICAL SIMULATION OF THERMALS. *International Union of Air Pollution Prevention Associations,* *Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1120-1125. 18 refs. (Dec. 6-11, Paper ME 26G.)*

Results of the simulation of thermals, which illustrate some of the differences between two and three-dimensional thermals, indicate the need for careful examination of two-dimensional numerical simulations of what are in fact three-dimensional flows. The long, slow, oscillatory behavior at high Reynolds numbers, commonly admitted by simulations of exactly two-dimensional thermals, was not present when three-dimensional motions were allowed to develop in an initially two-dimensional thermal However, due to the growing length scale of thermals, these later simulations could not be carried very far in time. A procedure for allowing the integration of a two-dimensional in the mean thermal which nevertheless may have three-dimensional smaller scale motions was tested with unsatisfactory results. Due to recent numerical work on geophysical fluid flow simulation, it is suggested that a significant research mechanism is available for simulating, and thus experimenting with, the atmospheric environment in specified areas.

23651 APTIC NO. 43164

Frank-Kemenetskii, D. A.

THE STEPHAN FLOW. *In: Diffusion and Heat Exchange in Chemical Kinetics. Princeton, N. J., Princeton Univ. Press, 1955, Chapt. 3, p. 128-145. 6 refs. (Translated by N. Thon.)*

Components in gaseous mixtures cannot diffuse independently of each other; in fact, diffusion at different rates must give rise to pressure differences and, consequently, produce mass flow. The significance of this flow was first pointed out by Stephan. If a heterogenous reaction is accompanied by a change of volume, it gives rise to a mass flow perpendicular to the surface at which the reaction takes place. A flow can also arise in a reaction involving no change of volume, namely, when the diffusion coefficients of the original reactants and the products of the reaction are different. The effect of the Stephan flow on the reaction rate is considered. Usually the Stephan flow is localized in a thin layer adjacent to the surface; therefore the surface curvature can be disregarded for purposes of an approximate calculation and the surface can be considered plane. In the presence of a high concentration of species, the diffusion of which limits the process, the Stephan flow can alter the reaction rate considerably. Particularly significant is the effect of the Stephan flow on vapor condensation processes. Many technical processes involve the condensation of a vapor strongly diluted with incondensible gases. Examples are the condensation recovery of volatile solvents, the condensation of spent steam in the condensers of steam engines, the condensation of water vapor prior to absorption of nitrogen oxides to obtain concentrated nitric acid, the condensation of ammonia from the nitrogen-hydrogen mixture after synthesis, and the condensation of sulfuric acid vapors in the concentration and manufacture of oleum. In such cases, the rate of the process is determined by the velocity of vapor diffusion to the surface at which the condensation takes place, across a layer of incondensible gas which forms at that surface.

23652 APTIC NO. 43152

Franklin, J. L.

MECHANISMS AND KINETICS OF HYDROCARBON COMBUSTION. *Ann. Rev. Phys. Chem., vol. 18:261-282, 1967. 205 refs.*

Mechanisms and rates of combustion reactions as reported in the literature (with an emphasis on work performed since 1961) are reviewed. The studies reviewed include combustion of hydrogen, carbon monoxide, and organic compounds including methane, higher-paraffin hydroacarbons, cycloparaffins, olefins, ethylene, acetylene, and aromatic hydrocarbons. Available rate constants for second and third-order reactions are presented.

23653 APTIC NO. 42745

Frie, W.

CALCULATION OF THE GAS COMPOSITION AND PROPERTY FUNCTIONS OF SF6. *(Berechnung der gaszusammensetzung und der materialfunktionen von SF6), Z. Physik (Berlin), vol. 201:269-294, 1967. 43 refs. Translated from German. Ralph McElroy Co., Austin, Tex., 28 p.*

NTIS: LA-TR-71-23

Dissociation can have a considerable influence on the composition of a gas, and must, therefore, be considered in calculations of composition. A program that allows calculation of particle densities and property functions of gas mixtures of any composition is described. This program can be used with and without consideration of the dissociation reaction. The property functions studied include density, enthalpy, specific heats c(p) and c(v), sound velocity, electrical conductivity, and thermal conductivity. The program was used for the gas sulfur hexafluoride and its components. The data used are summarized and the results are discussed with the help of diagrams. (Author abstract modified)

23654 APTIC NO. 42772

Fujita, Minoru and Toshio Yamauchi

DIRECT DETERMINATION OF LEAD IN GEAR OILS BY AN X-RAY FLUORESCENCE METHOD. *(Keiko xsen bunsekiho ni yoru giyayu-chu no namari no chokusetsu teiryo). Text in Japanese. Junkatsu (J. Japan Soc. Lubrication Engrs.), 17(6):29-33, June 1972. 12 refs.*

By X-ray fluorescence analysis, the lead content in gear oils was directly determined by calibration curves. Concentration ranges of calibration curves were 0.5-2.0 wt % for industrial gear oil and 0.5-0.3 wt % for automobile gear oil. The accuracy of this analytical method was within 3%, expressed as standard deviation. The analytical results of the lead content in various gear oils by chemical analysis and the X-ray fluorescence method were nearly identical. No problems were encountered in applying the X-ray fluorescence method to industrial analysis; it could be replaced by the chemical analysis in the laboratory. The total time required to complete the analysis if it was necessary to remove the contaminated materials was two hours; without removal it was 10 min, so that a quick and automatic analysis was made satisfactorily. (Author abstract modified)

23655 APTIC NO. 42345

Greenberg, J. Mayo

ABSORPTION AND EMISSION OF RADIATION BY NONSPHERICAL PARTICLES. *J. Colloid Interface Sci., 39(3):513-519, June 1972. 4 refs.*

The absorption and emission cross sections of finely divided particles are shown to depend strongly on particle shapes not only when the particles are comparable to the wavelength, but also when the particles are so small that the Rayleigh approximation is applicable. The average emissivity of spheroids whose size is small compared with wavelength is considered, as well as maximum absorption cross sections, absorption lines of dielectric materials, and extinction by rough particles. Detailed comparisons are shown for some infrared absorption spectra of enstatite and ice. (Author abstract modified)

23656 APTIC NO. 43526

Grigor yev, A. I., L. N. Reshetova, and A. V. Novoselova

PRODUCTION AND PREPARATION OF BERYLLIUM DIOXYHEXAACETATE. *(Polucheniye i svoystva dioksigeksaatseta berilliya, Be502(OCOCH3)6). Dok. Akad. Nauk SSSR, vol. 202:85-87, 1972. 5 refs. Translated from Russian. 7p.*

A new beryllium dioxyacetate compound was synthesized for the first time: Be502(OCOCH3)6. Interplanar distances in the crystal lattice of this compound are given and band assignments are made for its infrared spectrum. The compound was obtained by heating 3 g beryllium dioxyoctaacetate for 30 min at 200 deg in a sealed ampule. After cooling the ampule was opened, connected to an oil pump, and heated for 2-3 hr at about 200 C and a pressure of 0.05 mm Hg.

23657 APTIC NO. 42697

Gucker, Frank T., Jr., and Chester T. O Konski

ELECTRONIC METHODS OF COUNTING AEROSOL PARTICLES. *Chem. Rev., 44(2):373-388, 1949. 30 refs. (Presented at the American Chemical Society, National Meeting, 113th, Chicago, Ill., April 22, 1948.)*

The scope and range of two different rapid electronic methods of counting the particulate concentration in aerosols are discussed. The first method depends upon light scattering, and the second upon electrostatic charging of the particles. In the first method, a fine stream of the aerosol, protected by a flowing sheath of pure air, passes through a spot under intense dark-field illumination and scatters flashes of light forward upon a photosensitive cell. Each particle, about 0.6 micron or more in diameter, causes an electrical pulse which is sufficiently large, after suitable amplification, to operate a mechanical counter. This device will count particles weighing 5 times 10 to the minus 13 g, at rates up to 1000/min. A second type of electronic counter depends upon the electrostatic charging of aerosol particles forced at high velocity through a fine jet to impinge upon a metallic collector. The electrical pulses imparted to the collector by particles of 2.5 micron or larger are amplified to operate a mechanical counter. It was found that the pulse amplitude is proportional to the square of the particulate diameter. This empirical fact is in terms of the charging mechanism. Both counters may be applied to determine the size of the aerosol particles by using suitable electrical discriminators. The electrostatic device may be very useful for larger particles, while improvements in the photoelectronic counter may make it applicable to particles even smaller than those at the present time. (Author abstract modified)

23658 APTIC NO. 43499

Hamano, Kiyoshi and Kinji Hiramatsu

THE STUDY OF PYROLYTIC PRODUCTS OF POLYMER MATERIALS BY MASS SPECTROSCOPY (VII). THE COMBUSTION GAS FROM RESIN LAMINATED BOARD IN FIRE. *Mass Spectrosc. (Tokyo), 18(2):1022-1034, June 1970.*

The components of the combustion gas of 13 resin laminated boards were determined. The main gaseous components were carbon dioxide, argon, oxygen, nitrogen, carbon monoxide, methane, and hydrogen. Smaller amounts of hydrogen cyanide, benzene, and toluene were also detected. Ethane and ethylene were also detected when the combustion was carried out without blowing additional air into the combustion chamber. The amounts of hazardous gases formed by the combustion of these materials were much smaller than those from acrylic fiber combustion.

23659 APTIC NO. 42689

Hermann, Jorg and Wolfgang Herzog

BASIC PROCESSES OCCURRING IN THE FORMATION OF DUST MASS FLOW DENSITY PROFILES. *(Grundvorgaenge bei der Ausbildung von Staubmassenstromdichteprofilen). Text in German. Staub, Reinhaltung Luft, 32(5):198-202, May 1972. 15 refs.*

The results of experiments concerning the behavior of free falling dust within a tubular enclosure are reported. Glass powder, whose particles are largely of spherical shape, was used for the experiments. The experimental set-up consisted of three steel tubes of 411, 253, and 107 mm diameter, respectively, and of 3.3 m height. The dust was obtained from a reservoir via a vibrating trough, and was released into the vertical tubular enclosure via a plexiglass metering cylinder with a built-in stirrer and a small bottom hole. A series of collecting vessels in the form of short vertical tubes was arranged inside, at the bottom of the main tubular enclosure, spaced symmetrically from center to circumference, which served for catching and accumulating the falling dust. It was found that through the first 30 to 50 cm drop the dust moves in a closed, smooth stream, and then starts spreading. Three types of dust mass flow density profiles were ascertained. Type 1 showed a distinct maximum at the center of the tubular enclosure, with the profile dropping gradually to zero at the wall. This type occurred with coarse dust, moderate dust flow, and low drop height. Type 2 showed a maximum at center, dropping off to an intermediate minimum and rising again towards the wall. The flow density profile type 3 showed a minimum at center, rising gradually in approximately parabolic form to a maximum at the wall. Type 3 occurs with fine dust, large mass flow, and great height of drop. The forces acting upon the dust particles, including gravity, buoyancy, electric charges, impact between particles, and wall friction are discussed.

23660 APTIC NO. 43602

Houghton, Gerald

PARTICLE RETARDATION IN VERTICALLY OSCILLATING FLUIDS. *Can. J. Chem. Eng., 46(2):79-81, April 1968. 3 refs.*

An analytical expression was deduced for the ultimate velocity of a free particle in a vertically oscillating fluid by evaluating asymptotic forms of Floquet s solution to the Mathieu equation arising from the nonlinear Langevin equation describing the particle-fluid interactions. It was rigorously demonstrated using general Mathieu theory that directional particle motion in a gravitational field can be retarded by sinusoidal fluid oscillation when the particle-fluid drag law is of square form. The earlier Rayleigh-Ritz approximation for the retarded particle velocity is shown to be in good agreement with the results of Mathieu theory, as summarized in graphical form. (Author abstract modified)

23661 APTIC NO. 43197

Hudy, J., Jr. and A. W. Deurbrouck

EVALUATION OF CONTINUOUS RECORDING X-RAY ASH METER. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Coal Research Center, RI 7101, 20p., April 1968. 3 refs.*

An investigation was made to determine the applicability of the Cendrex X-ray instrument for the measurement of the ash content of washed bituminous coal products. The results obtained for selected products from six preparation plants in the Appalachian region and one preparation plant in the midwestern region are described. Emphasis was placed on low ash bituminous coal products suitable for utility or metallurgical markets. There was good agreement between the results obtained by conventional ash determination methods and by ash determination using the Cendrex for all products tested. The X-ray instrument, its calibration, and performance are discussed in detail, including the ash and elemental composition of the six coalbeds. (Author abstract modified)

23662 APTIC NO. 42836

Hurt, W. B. and W. C. Grable

EXCITATION TRANSFER AND PENNING IONIZATION REACTIONS BETWEEN HELIUM METASTABLES AND CARBON MONOXIDE. *J. Chem. Phys., 57(2):734-737, July 15, 1972. 9 refs.*

Absolute intensity measurements were made of the radiating states of the carbon atom and carbon monoxide ion produces in a flowing afterglow cell by the reaction between a helium metastable and carbon monoxide. These measurements coupled with absorption measurements of the metastable helium and carbon monoxide densities are sufficient for calculating the rate constants for the production of excited products. Of the total reaction rate between the metastable helium and carbon monoxide, 4% corresponds to the production of a dissociated carbon monoxide molecule with the carbon atom in an excited state and; the remaining percentage of the total rate corresponds to Penning reactions into the three energetically available electronic levels of the positively charged carbon monoxide ion with about equal probabilities. (Author abstract modified)

23663 APTIC NO. 42837

Imura, Yutaka and Haruhiko Ohya

A STUDY ON PORE SIZE DISTRIBUTION OF MODIFIED ULTRATHIN MEMBRANES. *Bull. Fac. Eng., Yokohama National Univ., vol. 21:113-121, March 1972. 35 refs.*

An equation to estimate the thickness of ultrathin membranes was derived assuming constant physical properties and compared with the measured thickness in the range 0.2-0.5 micron. The effective evaporation time calculated by the equation was 2-3 min. The nitrogen gas adsorption isotherms at 195 C on modified ultrathin membrane were measured and the surface area of the pores was determined by the BET equation. Distribution of pore volume and on the assumption of straight cylindrical pores in the membrane, the cross-sectional area of pores and the mean pore radius were calculated. (Author abstract modified)

23664 APTIC NO. 42821

Kallis, James M., Milton Goodman, and Carl R. Halbach

VISCOUS EFFECTS ON BIOWASTE RESISTOJET NOZZLE PERFORMANCE. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 9p., 1972. 7 refs. (Presented at the American Institute of Aeronautics and Astronautics Aerospace Electric Propulsion Conference, 9th, Bethesda, Md., April 17-19, 1972, Paper 72-450.)*

The Rae computer program was modified and used to predict low thrust, thick boundary layer flow in small nozzles using typical biowaste expendables from a Sabatier life support system as propellants. Data were obtained for flow field in and performance of a 25-mlb thrustor with a conical nozzle suitable for space station attitude control. A comparison of inviscid expansion with the Rae viscous flow program showed the latter to have lower values of specific impulse (as much as 12%), higher pressure ratios, higher temperature ratios, and lower velocities, all of which would affect previously predicted thrustor performance data as well as exhaust plume characteristics. The Rae program was also run for high and low chamber temperature gases using a 10-mlb thrustor with a trumpet nozzle, and the computed results were compared with experimental data. The experimental data were, in general, believed valid within 1%. However, the chamber temperature, which was an essential input to the Rae program, was not directly measured in the thrustor but was instead derived by energy balance calculations involving methods which could result in a 3% error between measured and predicted performance. For the pure gases, hydrogen, water, carbon dioxide, the predicted specific impulse values are, on the average, 0.7% higher than those of the experimental data. In the case of methane, the relatively large differences between predicted and test specific impulse values are attributed to dissociation reactions and are, therefore, disregarded in calculating statistical errors. (Author conclusions modified)

23665 APTIC NO. 43348

Kotoyori, Takashi

ENERGY OF ACTIVATION FOR OXIDATIVE PYROLYSIS OF SEVERAL PLASTICS. *(Plastics no netsu banka bunkai ni yosuru kasseika energy). Text in Japanese. Ministry of Labor, Tokyo (Japan), Research Div. of Chemical Engineering, RIIS-RR-19-4, 19p., April 1971. 25 refs.*

Activation energies for oxidative pyrolysis, and frequency factors and specific reaction rates of Arrhenius equation for 11 representative thermoplastic resins in oxygen, air, and nitrogen, were determined to study the behavior of plastics exposed to heat and oxidation. Resins containing hydrogen gave rise to dehydrogenation (scorching) and began to decompose at little less than 200 C in the presence of oxygen; activation energies ranged within 10-20 kcal/mol. The logarithm of frequency factor increased with an increase in energy activation. Oxygen concentration rather than specific reaction rate affected the rate of pyrolysis. Occurrence of ignition in plastics was due to an initiation of oxidation and a self-heating phenomenon on the surface of the molten polymer. The coexistence of trace amounts of water affected the decrease in energy activation for oxidative pyrolysis; specific reaction rate, however, was larger with the drier than with the wetter sample.

23666 APTIC NO. 42860

Kruelle, G.

THEORETICAL TREATMENT OF CURRENT, MASS FLOW, AND RELATED DISTRIBUTIONS IN MPD PLUMES. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 19p., 1972. 35 refs. (Presented at the American Institute of Aeronautics and Astronautics Electric Propulsion Conference, 9th, Bethesda, Md., April 17-19, 1972, Paper 72-501.)*

Assuming a model MPD (magnetoplasmadynamics) thruster geometry, the current distribution in an MPD plume is calculated using the meridional current stream function equation derived from the Ohm s law. In particular, the influence of mass velocities originating from j times B-forces is investigated. Several model cases are treated. The distribution of a number of quantities depending on the current distribution is presented, and integrals like thrust and energy fractions are calculated for each case. The current is carried farther out of the geometry as the magnetic field is increased. Influences of azimuthal and meridional velocities both tend, in principle, to increase the current density in the electrode environment and, simultaneously, stretch out the current field farther downstream, thus minimizing energy gains. Meridional velocities do not contribute largely (in a positive sense) to the energy balance, so the device, under conditions here considered, cannot be defined as a space charge neutralized ion thruster. A large fraction of thrust originates from overpressure produced by radial j times B forces at the plume root. Mass flows fed through the thruster must be consistent with this pressure profile. (Author abstract modified)

23667 APTIC NO. 43140

Kusnetz, Howard L., Bernard E. Saltzman, and Marshall E. Lanier

CALIBRATION AND EVALUATION OF GAS DETECTING TUBES. *Am. Ind. Hyg. Assoc. J., 21(5):361-373, Oct. 1960. 25 refs.*

Theoretical and practical principles for the calibration of direct reading colorimetric gas detecting devices are presented. Techniques of calibration and evaluation, establishment of gas concentrations, reading of the tubes, estimation of atmospheric concentration, and the characteristics of the tubes tested are discussed. A subsequent evaluation of the environment by an interpretation of the tube data is made.

23668 APTIC NO. 42383

Leckner, B.

THE SPECTRAL AND TOTAL EMISSIVITY OF CARBON DIOXIDE. *Combustion Flame, 17(1):37-44, Aug. 1971. 17 refs.*

The calculation of radiative heat transfer from flames and combustion gases requires, in the general case of nonhomogeneous gases, a knowledge of the spectral characteristics of the gases. An analysis was made of available spectral data on carbon dioxide, extended with an approximative description of the 15 micron, 10 micron, and 2 micron bands, in the form of a comparison with measured total emissivities. The contribution of the bands to the total emissivity is shown at various temperatures and path lengths. The spectral emissivity is expressed as mean-values over wave- number intervals by means of the statistical band model. The agreement between Hottel s diagrams of total emissivities and the total emissivities calculated on the basis of spectral data is good for optical path lengths greater than 1.0 cm atm. If Hottel s values are corrected in the small-path length region for the possible influence of CO2 in the air layer between the measuring instrument and the gas container, there remains a discrepancy of less than 15% around path lengths of 0.1 cm atm.

23669 APTIC NO. 43621

Liederman, David, J. E. Bowen, and O. I. Milner

DETERMINATION OF ARSENIC IN PETROLEUM STOCKS AND CATALYSTS BY EVOLUTION AS ARSINE. *Anal. Chem., 31(12):2052-2055, Dec. 1959. 9 refs. (Presented at the American Chemical Society, Division of Petroleum Chemistry, Meeting, 136th, Atlantic City, N. J., Sept. 1959.)*

An improved method has been developed to determine arsenic in reforming charge stocks and catalysts. The range of the method for charge stocks is from zero to several hundred ppb, and from zero to several thousand ppm for catalysts, such as cobalt oxide-molybdena-alumina, chromia-alumina-molybdena, and platinum-bearing catalysts. The arsenic is extracted from the naphtha and separated as arsine, which is measured spectrophotometrically after reaction with silver diethydithiocarbamate in pyridine. It was found that metals or salts of metals such as cobalt, mercury, nickel, platinum, silver, palladium, and large amounts of copper, chromium and molybdenum interferred with the evolution of arsine. Among these, cobalt, nickel, platinum, chromium, and molybdenum are likely to be encountered in catalysts used in the petroleum industry. Cobalt, nickel, and most of the platinum are eliminated by filtering the leachate after the peroxide fusion. Catalysts were fused before the arsine separation and spectrophotometric determination.

23670 APTIC NO. 43409

Ligten, R. F. van

HOLOGRAPHIC MICROSCOPY AND SMALL PARTICLES. *Am. Lab., 1969: 23-24, 26, April 1969. 9 refs.*

The two-step method of interferometry for establishing the intensity variation at the plane of intersection of object bundle and recording plane and the phase variations in the recording plane in holographic microscopy is presented. A unique feature of holography is time differential interferometry. When microscopy can be applied or when high magnification can be obtained with adequate resolution in the holographic process, the arrest of such time-dependent events can be applied to very small objects. The first application of holography is the Disdrometer of Technical Operations. This instrument records particles in a volume about 1 in. deep. The smallest particles that can be resolved and recognized must be at least 25 micron in diameter. The holograms thus obtained by applying Parrent s method are called Fraunhoferholograms. Magnification of the holographic images done with a microscope, and by lensless methods, introduce aberrations. To circumvent problems, the image should be magnified first, and then the hologram of the magnified image should be produced. The image quality is much better, and the particles that can be resolved and measured are in the region of 2 to 3 micron. Holograms of very fast moving particles were made with a pulsed laser used in combination with the holographic microscope capable of transillumination as well as incident illumination.

23671 APTIC NO. 42623

Lipkea, William Henry

NITROUS OXIDE DECOMPOSITION AND ITS SUBSEQUENT REACTION WITH ATOMIC OXYGEN TO PRODUCE NO - A SINGLE-PULSE SHOCK TUBE STUDY. *Drexel Univ., Philadelphia, Pa., Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1972, 227p. 81 refs.*

The thermal decomposition of nitrous oxide in excess krypton, and its subsequent reactions to form nitric oxide, molecular nitrogen, and molecular oxygen were studied in the temperature range 1400 2000 K at total concentrations of approximately .00002 moles/cu cm. The investigation was conducted behind reflected shocks in a single-pulse shock tube, and the quenched products were withdrawn and analyzed by gas chromatographic techniques. The reaction mechanism, rate constants, and temperature dependence for the rate constant are presented for the decomposition of N2O. (Author abstract modified)

23672 APTIC NO. 43139

Low, M. J. D., Michie Shimizu, and J. C. McManus

REACTIVE SILICA. IV. THE PYROLYSIS OF CHEMISORBED SILANES. *Preprint, New York Univ., N. Y., Dept. of Chemistry, 8p., 1971. 12 refs.*

The stability of chemisorbed silane layers was investigated by infrared spectroscopic techniques. When a silica, bearing certain chemisorbed silanes, is heated to a high temperature in vacuum, the chemisorbed layer is disrupted and the surface of silica is modified. Surface (--)SiH2 groups are formed and the silica surface becomes unusually reactive. These preliminary results, as well as other data on the pyrolysis of surface esters, suggest that a silica surface can become activated by the destruction of chemisorbed methyl and methoxy groups or perhaps methyl radicals formed by the disruption of the chemisorbed species. The activation does not seem to occur if the chemisorbed group contains two or more carbon atoms. (Author abstract modified)

23673 APTIC NO. 43387

MacIntyre, Ferren

GEOCHEMICAL FRACTIONATION DURING MASS TRANSFER FROM SEA TO AIR BY BREAKING BUBBLES. *Tellus (Uppsala), 22(4):451-461, 1970. 33 refs.*

The combination of counter-ion attraction to surfactant films, and the ability of small bubbles to eject a micron-thin slice of the bubble interior surface as jet drops, is sufficient to account for much of the reported chemical fractionation in the transfer of salt from sea to air. The enrichment of phosphate in bubble-produced aerosol from a solution containing radioactive P(-32) and Na(-22) is defined as E equals (P(-32)/Na(-22)) aerosol over (P(-32)/ Na(-22)) solution minus 1, and is positive for all solutions studied. Phosphate is always present in excess in drops from breaking bubbles. For jet drops, E lies between 0.01 and 10; for drops from film caps which have drained and lost nearly all of their bulk solution, E may rise as high as 1000. Phosphate is preferred to chloride as a counter-ion below positively charged surfactants, and also seems to be bound to peptide-like uncharged materials. The mechanism is not specific for phosphate, but can be invoked to explain the enrichment of any constituent of marine aerosol whose absolute ionic potential is greater than the sodium or chloride ions.

23674 APTIC NO. 43334

MacKinnon, D. J. and T. R. Ingraham

NOTE ON MINIMIZING NOX POLLUTANTS FROM STEAM BOILERS. *J. Air Pollution Control, 22(6):471-472, June 1972. 8 refs.*

Thermodynamic and kinetic data relative to the reactions: nitrogen + oxygen yields 2 nitric oxide and 2NO + O2 yields

2 nitrogen dioxide were examined to estimate the probable ratio of NO to NO2 in steam boiler gases and to predict the effects of NO emissions of various time-temperature profiles within the fire-box of a steam boiler. Over the range of temperature from 980 to 3140 F, the equilibrium NO content of a gas mixture containing 2% oxygen and 70% nitrogen is expected to increase from zero to about 2800 ppm. Within the same range of conditions, the NO2 content increases from 0.05 to 0.8 ppm. The NO2 does not form to any appreciable extent within a steam boiler. A variety of reaction mechanisms for NO formation, some involving free radicals, are presented to describe a series of stages in the mechanism for different reaction conditions. The net rate of NO formation over the temperature range 3200-4000 F was calculated for a gas mixture containing 70% N2, 0.5 to 4.0% O2, and the balance of inert material. The results indicate that the maximum amount of NO is expected to 3860 F and that at 3952 F no NO can remain in the system, since its decomposition rate is more rapid than its formation rate. The major effect of changing oxygen concentration is likely to be achieved through its influence on temperature rather than as a concentration term. The formation of nitrogen oxides can be most effectively minimized by distributing the flame front in such a way as to maintain a low temperature-time profile within a boiler.

23675 APTIC NO. 43386

Madelaine, G. J., D. V[illegible]la, and N. Clerc

AIR POLLUTION AND FINE PARTICLES. *(Pollution atmospherique et particles ultrafines). Text in French. In: Etat d avancement des principales etudes au ler janvier 1970. Centre d Etudes Nucleaires, Fontenay-aux-Roses (France), Groupe Aerosols et Mines, CEA-N-1364, p. 11-13, Jan. 1970.*

Completed and planned studies on photolysis and radiolysis in aerosols are described. Reactions capable of producing fine particles were studied in a 200-liter aerosol chamber in controlled atmosphere consisting of nitrogen, nitrogen + oxygen, nitrogen + oxygen + water, or nitrogen + oxygen + water + sulfur dioxide. The O2 concentrations varied from 50 ppm to 1%, the water concentrations from 2 ppm to 50% relative humidity, and the SO2 concentrations were in a range of 0-100 ppm. No particle formation due to an irradiation at 3000 A and with an intensity of 20 W was evidenced. The SO2 concentrations, determined continuously to a lower limit of 0.01 ppm, decreased when no irradiation or ultraviolet irradiation during the formation of nuclei was applied. The characteristics of aerosols as a function of different parameters will be studied in natural air over urban, rural, coastal, and other areas to derive possible correlations between different parameters. Diurnal and nocturnal variations of the air pollution will be investigated, and simultaneous measurements will be made of the total particle concentration above 0.0000001 cm, the mean diameter, the granulometric spectra of aerosols above 0.3 micron, the solar radiation, pressure, temperature, relative humidity and SO2 and nitrogen oxides concentrations. The formation of particles in filtered air due to photolysis will be studied.

23676 APTIC NO. 43246

Masek, V.

SOOTS FROM SOLID FUELS. *(Sazhi ot tverdykh topliv). Hyg. Sanit. (English translation from Russian of: Gigiena i Sanit.), 35(7):106-109, July 1970. 11 refs.*

NTIS: TT 70-50048/3

To obtain detailed information on the composition of soot produced by the combustion of solid fuel, several samples of the soot discharged by furnaces around the city of Ostrava were collected. The 12 samples of raw soot which were analyzed included two samples each from the combustion of coke, bituminous, and brown coal, and three each from the combustion of brown coal briquets and wood. The soot contained considerable amounts of noncombustibles, one-half of its total amount being silicon dioxide, 2-9% iron, and 0.3-0.6% sulfur, with a small amount of arsenic. The specific surface of samples of raw soot is not large, indicating the presence of substances with a small specific surface. The lowest content of 3,4-benzpyrene was discovered in soot from coke, and the highest content in soot from wood and bituminous coal.

23677 APTIC NO. 42833

Matsuda, Shimpei

GAS PHASE HOMOGENEOUS CATALYSIS IN SHOCK WAVES. II. THE OXIDATION OF CARBON MONOXIDE BY OXYGEN IN THE PRESENCE OF IRON PENTACARBONYL. *J. Chem. Phys., 57(2):807-812, July 15, 1972. 15 refs.*

The catalytic effect of iron pentacarbonyl on the oxidation of carbon monoxide was investigated in shock waves. Reaction mixtures, typically containing 200 ppm iron pentacarbonyl, 4% carbon monoxide, 2% oxygen, and 94% argon, were shock heated to 1000-2400 K in incident shock waves. The rate of carbon dioxide formation was followed by monitoring infrared emission at 4.20 micron. In the presence of small amounts of iron pentacarbonyl, the rate of carbon dioxide formation was greatly accelerated. The observation with a time-of-flight mass spectrometer coupled to a shock tube, to study the formation of intermediate species, suggested that the larger portion of iron existed as polymeric iron oxides, although small mass peaks due to positively charged iron and iron oxide were detected. A mechanism of the catalytic oxidation of carbon monoxide by iron pentacarbonyl in the homogeneous gas phase is discussed. The catalytic effect of iron pentacarbonyl disappeared below about 1600 K where the iron vapor pressure became supersaturated. This indicates the removal of iron and iron-containing species from the gas phase by a condensation process. At temperatures below 1400 K evidence for the direct oxidation of carbon monoxide in the presence of an iron carbonyl was obtained. (Author abstract modified)

23678 APTIC NO. 43518

Mayer, Walter A.

ACTIVATION ANALYSIS OF VANADIUM IN MINERAL OIL. CATASTROPHIC OXIDATION BY VANADIUM OXIDE. *(Aktivierungsanalyse von Vanadium in 01). Erdoel Kohle (Hamburg), 24(6):416-417, June 1971. 2 refs. Translated from German. 5p.*

Activation analysis is a quick and reliable method for the determination of vanadium concentration in oil. After an activation time of 10 min in a neutron flux of 3 times 10 to the 8th/sec/em and a counting time of 20 min, the minimum detectable amount is 0.002 ppm vanadium, when a 100 g sample is used. The oxidation rate in heat-resistant steels increases rapidly above 650 C in the presence of vanadium pentoxide; this phenomenon is called catastrophic oxidation. Another component in fuel oil is sodium, which occurs in the form of sodium sulfate in the ash. Sodium sulfate and vanadium pentoxide together form a molten mass of a low melting point which is capable of dissolving the protective film of oxide on heat resistent alloys. Even if the melting point is not reached, deposits of vanadium pentoxide and sodium sulfate form in gas turbines using oil as fuel, which greatly reduce the degree of effectiveness of the turbine. Regular analyses of vanadium are carried out in refineries. For the customary analysis of vanadium in oil, major amounts of oil have to be reduced to ash, which is time consuming and part of the vanadium mist be lost during the process. In contrast, activation analysis provides greater reliability and accuracy of measuring with shorter periods of measurement.

23679 APTIC NO. 42350

Merryman, Earl L. and Arthur Levy

SULFUR OXIDE CHEMISTRY IN LOW-PRESSURE FLAMES. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd,* *Washington, D. C., 1970, p. 361-370. 19 refs. (Dec. 6-11, Paper CP 7A.)*

Data taken from recent and previous flame probings as they relate primarily to sulfur dioxide and sulfur trioxide formation in flames are correlated and evaluated. Information is presented on the kinetics and mechanisms of the flame reactions and on sulfur and on sulfur oxide intermediates that exist during combustion of the fuels. Recent flame data are presented on sulfur dioxide and sulfur oxide troxide formation in methyl mercaptan flames, and on the sulfur oxide intermediates existing in the methyl mercaptan flames and in carbonyl sulfide flames. Previously published data from the probing of hydrogen sulfide and carbonyl sulfide flames are also discussed. Hydrogen sulfide, carbonyl sulfide, and methyl mercaptan were chosen as fuels for study in this program, primarily to help delineate the effects of bonding of the sulfur in the fuel on the types and amounts of sulfur-bearing intermediates and final products resulting from the oxidation of the fuel. It is hoped that a better understanding of the basic processes involved in the oxidation of sulfur compounds in flames will lead to new avenues of approach to the solution of the sulfur oxide air pollution problem. The kinetics and mechanisms of the flame oxidation processes in these studies are obtained by development of the microstructure of the flame reactions. In this procedure, stable species are removed from various positions in the flame zone and are passed into the mass spectrometer or other analytical train for analysis. Composition, temperature, and velocity profiles are developed and from these data the mechanisms and kinetics of the flame processes are deduced and calculated.

23680 APTIC NO. 42859

Michels, Charles J. and Thomas M. York

EXHAUST FLOW AND PROPULSION CHARACTERISTICS OF A PULSED MPD ARC THRUSTER. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 10p., 1972. 13 refs. (Presented at the American Institute of Aeronautics and Astronautics Electric Propulsion Conference, 9th, Bethesda, Md., April 17-19, 1972, Paper 72-500.)*

The results of an experimental investigation of the near-field megawatt MPD-Arc exhaust flow are presented. The thruster was operated single-shot and results were obtained with and without auxiliary magnetic field. The data consists of measurements of impact pressure with a newly designed piezo pressure probe system and of plasma density determined in earlier work. The data were analyzed to determine propulsion characteristics such as thrust, impulse bit, velocity, and mass accounting. New impact pressure data reconfirm the initial starting transient pressure pulse and add new radial and temporal profile data for the later occurring plasma flow part of the exhaust. These impact pressures varied from 1000 to 4000 N/sq m for the few hundred microseconds duration of the plasma flow portion for the self-field and for auxiliary magnetic field cases between 1.0 and 2.0 T. Calculated exhaust velocity during the plasma flow period varied from 2 times 10 to the 4th to 7 times 10 to the 4th m/sec and were functions of radial position, as well as auxiliary magnetic field. For the self-field case, the experimentally determined velocities agree with Huegel s theory for the case where acceleration is produced entirely by electromagnetic force. For the self-field case, although the thrust varies with time under the influence of decaying current and mass flow rate, there is a region which approaches the steady-flow thrust (proportional to current squared). Thrust increases monatonically with auxiliary magnetic field. Impulse bit ranged from 3 to 16 N sec, dependent on magnetic field strength. (Author conclusions modified)

23681 APTIC NO. 42320

Mikolaj, Paul G.

ENVIRONMENTAL APPLICATIONS OF THE WEIBULL DISTRIBUTION FUNCTION: OIL POLLUTION. *Science, 176(4038):1019-1021, June 2, 1972. 6 refs.*

Some preliminary results of a new method for statistically analyzing environmental pollution data are presented, in which the Weibull distribution function is used as a correlating model. The method appears to have considerable potential for interpreting ambient pollutant concentrations. The Weibull equation is an empirical three parameter distribution function which includes a threshold parameter representing the minimum value that a variable is likely to attain. Application of the Weibull function to data of beach contamination from natural oil seeps along the southern California coastline shows that the tar deposition process may be governed by several spatially distinct mechanisms of oil transport. Application to oil spill data from 1956-69 shows that the threshold value for the size of major spills is 150,000 l and, therefore, sufficient equipment should be stockpiled at a given staging area to deal with a spill of at least this size. The function also indicates that a major oil spill is likely to affect at least 7 km of coastline, while the expected duration of an oil spill incident has a threshold value of 1.3 days, reflecting the dissipative action of the marine environment, and a median value of 13 days. The Weibull distribution may well be applicable to automotive emissions, pesticide and trace metal contaminant concentrations, and marine fauna mortality.

23682 APTIC NO. 42440

Minnick, L. John

FUNDAMENTAL CHARACTERISTICS OF PULVERIZED COAL FLY ASHES. *Am. Soc. Testing Mater. Proc., vol. 59:1155-1177, 1959. 8 refs. (Presented at the American Society for Testing and Materials, Annual Meeting, 62nd, June 21-26, 1959.)*

Data are presented relating to the basic properties and characteristics of fly ash with emphasis on information unavailable in previous publications. The heterogeneous property of fly ash is considered and a critical analysis is made of the component parts of the material including a study of structure and mineral placement. The investigation utilizes chemical and physical tests based on x-ray diffraction and fluorescence spectrographic analyses, microscopic examination, and a few differential thermal analyses. Pozzolan reactives are considered using several curing conditions in mixtures made with high calcium and dolomitic lime. Some information is included which was obtained from an extensive questionnaire sent to fly ash producers regarding types of coal, methods of burning, and methods of collection.

23683 APTIC NO. 42426

Miyazaki, Shozo and Saku Takahashi

ON THE REACTION OF OXYGEN ATOM WITH CARBON DISULPHIDE (PART 3). *Mem. Def. Acad. Japan, 11(3):329-338, 1971. 8 refs.*

Studies on the reaction between oxygen atom and carbon disulfide show that the main products are sulfur monoxide radical and carbon monoxide. This result has stressed the stability of these products in the gas phase. The reactions of these species with oxygen atom proceed rather slowly in comparison with the reaction of oxygen atom with nitrogen dioxide. The reaction of NO2 with SO was investigated at room temperature. Sulfur monoxide reacted very rapidly with NO2 and produced sulfur dioxide and nitric oxide. SO + NO2 yields SO2 + NO + 59 kcal. The rate constant of the reaction of SO with NO2 was 2.0 times 10 to the minus 12th power cc/molecule /sec at room temperature. (Author summary modified)

23684 APTIC NO. 42605

Miyazaki, Shozo and Saku Takahashi

ON THE REACTION OF OXYGEN ATOM WITH CARBON DISULPHIDE. (PART 2). *Mem. Def. Acad. Japan, 11(3):307-327, 1971. 22 refs.*

Studies of the reaction of oxygen atom with carbon disulfide under stoichiometric conditions show that the main species of products are carbon monoxide and sulfur monoxide radical. When the reaction between oxygen atom and SO thus formed is carried out in argon carrier, the chemiluminescent reaction between SO and oxygen atom produces the SO2 afterglow and the SO2 intensity is porportional to the concentration of oxygen times the concentration of SO. The reaction can be expressed by the following scheme: O + SO + Ar yields SO2 + Ar with a rate constant of 2.0 times 10 to the minus 31st power sq cc/sq molecule sec at room temperature. This reaction is the cominant process to remove SO which is otherwise remarkably inactive. The intensity of chemiluminescent emission of CO2 in the (O + CO) reaction and the rate coefficient was investigated. The intensity obeys an expression of the type I equals k times the concentration of CO times the concentration of O, and this CO flame emission is mainly a singlet-transition to the ground state of CO2. The rate constant at room temperature for the overall reaction is 5.8 times 10 to the minus 33rd power sq cc/sq molecule sec, the reaction being expressed as O + CO + Ar yields CO2 + Ar. (Author summary modified)

23685 APTIC NO. 43400

Modzalevskaya, M. L. and A. G. Blokh

INFLUENCE OF THE SPECTRUM OF SOOT PARTICLE SIZES ON THE RADIATION OF LUMINOUS FLAMES. *Thermal Eng. (English translation from Russian of: Teploenergetika), 18(3):91-97, March 1971. 22 refs.*

One of the important parameters which determine the radiating capacity of luminous flames is the effective absorption cross section of the soot particles formed in the flame during fuel combustion. To determine this quantity, it is necessary to know the spectral absorption coefficients and the particle size distribution of the soot. To examine the nature of the size distribution of soot particles on the effective spectral absorption cross section and scattering, the particle size composition of soot in the flames of light liquid fuel was examined under different combustion conditions. The excess air factor was varied from 1.04 to 1.35 and the mean furnace volumetric heat release was 600 times 1000 kcal/(cu m/hr). Helical and register burners were used in the test. The vane angle of the latter was 55 deg and the lap was varied from 0.98 to 1.39. The soot was sampled by a special probe at different distances from the burner unit. Based on these investigations, a generalized relation was established for the size distribution in the flame of soot particles, encompassing diverse conditions of combustion of liquid fuel. The feasibility of calculating the effective absorption cross section for real polydisperse compositions of soot particles in luminous flames according to the mean square particle diameter is demonstrated.

23686 APTIC NO. 43580

Morrison, Philip

X-RAY SHIELD. *(Atomic Energy Commission, Washington, D. C.) U. S. Pat. 2,580,360. 3p., Dec. 25, 1951. 4 refs. (Appl. Jan. 31, 1945, 9 claims).*

The suitability of uranium as a substitute for lead in penetrating radiations shielding is described. Although uranium is a heavy metal, its use has been avoided in the past because of an undesirable characteristic of uranium, the metal being itself an emitter of alpha and beta rays. This difficulty can be overcome, however, by coating the uranium metal with a heavy metal pigment, such as red lead. For two million electron volt radiations, an equivalent shield of uranium is 20% thinner than a tungsten shield, and 45% thinner than a shield of lead for the same absorption.

23687 APTIC NO. 43237

Orr, Clyde, Jr., H. G. Blocker, and Jane B. Garrett

STANDARDIZATION OF SURFACE PROPERTIES OF FINE PARTICLES. (FINAL REPORT). *Georgia Inst. of Tech., Atlanta, Engineering Experiment Station, Army Contract DA-36-039-sc-42588, Signal Corps Proj. 152B, Army Proj. 3-99-15-022, EES Proj. 228-197, 47p., April 30, 1954. 12 refs.*

NTIS: AD 34004

The surface properties of finely divided solid materials, particularly the heats of adsorption, were investigated. Two methods were used in making heat of adsorption measurements. Experimental data were obtained for a nickel-silica catalyst, powdered nickel, and coconut charcoal. Considerable attention was given to gas purification, solid surface preparation, and pressure measurements in the low-pressure range. Most extensive investigation was given to the charcoal. The first molecules of nitrogen gas adsorbed gave up considerably more energy than condensation released, later adsorbing molecules gave up only a little more energy than is released by condensation, and still later adsorbing molecules gave up approximately twice the heat of condensation until complete monolayer coverage of the surface resulted. The other materials gave similar results in the range of conditions in which they were tested. Better heat of adsorption data at low-surface coverage were obtained by calculation from adsorption isotherms using the Clapeyron-Clausius equation than were obtained by actual measurement. Gases of highest purity must be used in obtaining meaningful heat of adsorption data. The heat evolved by adsorbing-gas molecules depends on the possibility of interaction with atoms in the adsorbent surface as well as interaction with other adsorbed-gas molecules. Differential heat of adsorption information can reveal much information about the surface structure of adsorbents and catalysts. Further studies of heat of adsorption, particularly adsorption at low-surface coverage, are strongly recommended.

23688 APTIC NO. 43675

Perelman, A. Ya

ON THE DETERMINATION OF SIZE DISTRIBUTION OF NATURAL AEROSOLS BY EXTINCTION COEFFICIENT. *Bibliogr. Meteorol. Int., no. 104:349-351, 1970. 5 refs.*

The asymptotical formula for scattering and extinction cross sections is obtained, and a transparency method is considered which allows calculation of only transparency particle distribution by the data of the volume scattering coefficient. A new method is proposed which is available for both transparent and absorbing particles and some other problems of atmospheric optics.

23689 APTIC NO. 42913

Pratt, David T., Barry R. Bowman, Robert J. Robertus, and Clayton T. Crowe

COMPARISON OF HOMOGENEOUS GAS-PHASE REACTION KINETICS FOR COMPLETE SEGREGATION AND COMPLETE MICROMIXING. *Preprint, Combustion Institute, Western States Section, 12p., 1972. 15 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72- 6.)*

Four models of combined chemical kinetics and turbulent mixing for the combustion of pre-mixed pyrolized methane and air, which emphasize the difference between the assumptions of complete molecular micro-mixing and no micro-mixing whatever, are presented. The four models considered are: simple plug, completely segregated perfectly-stirred reactor, micro-mixed perfectly stirred reactor, and two-environment model. Neither model 1 nor 2 incorporates any mechanism whatever for mixing to occur at the molecular scale; model 3 allows for instantaneous perfect mixing while only the fourth model permits mixing at a finite rate. Calculations in all four cases were performed for adiabatic, steady-flow combustion of a carbon monoxide-hydrogen/air mixture, representing pyrolized methane and air in stoichiometric proportions. Combustion was assumed to occur at 10 atm with an inlet temperature of 1000 K. Comparison between predictions of the various models was performed on the basis of equal mass flow rates

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and combustor volumes. All four models predicted nearly the same nitric oxide mole fractions. The two environment model is superior to the other familiar simple models for predicting combustion phenomena, including pollutant formation, in premixed, steady-flow combustors. Only this model can predict combustion at all conditions where combustion is in fact observed and account for arbitrary residence time distribution, chemical reaction, and finite mixing rates.

23690 APTIC NO. 42424

Querfeld, C. W., M. Kerker, and J. P. Kratohvil

MULTIPLE SCATTERING IN A SYNTHETIC FOGGY ATMOSPHERE. EXPERIMENTAL RESULTS. *J. Colliod Interface Sci., 39(3):568-582, June 1972. 15 refs.*

Measurements of polarized radiances multiply scattered by a plane- parallel slab containing spherical scatterers of known single scattering properties are described and compared with calculations made with scalar radiative transfer theory and with a vector Monte Carol calculation. these measurements were obtained with a newly designed light-scattering photometer which simulates closely the requirements of the theory for the plane-parallel monochromatic beam. A polystyrene latex of narrow size distribution and of the average diameter .245 microns was investigated at various concentrations. Two wavelengths were used at four angles of incidence, and the angular variation of the Stokes radiance vector was measured in both the transmitted and back-scattered half- spaces. The experimental results are in excellent accord with the theoretical calculations. Accordingly, this experimental arrangement can serve as an analog computer for systems for which the theory is either intractable or too complex for machine calculations. (Author abstract modified)

23691 APTIC NO. 43410

Riedmuller, G. F. and T. L. Barber

A MINERAL TRANSITION IN ATMOSPHERIC DUST TRANSPORT. *White Sands Missile Range, N. Mex., Atmospheric Sciences Lab. DA Task 1P620901A199-05, ECOM-5072, 13p., Aug. 1966. 3 refs.*

NTIS: AD 641706

The minerals mirabilite and thenardite differ only in number of waters of crystallization, and may easily change from one state to the other. The identification of the minerals in airborne dust by infrared absorption spectroscopy and the rapidity of the transition are discussed. Mirabilite and thenardite or the intermediate states of sodium sulfate can be identified in the spectra of atmospheric dust, using a potassium bromide pellet, by location of the 615-623 wave number shifting peak. If one is concerned with determining with sodium sulfate is present in large samples, the use of a polyethylene film is suggested. However, for microsamples of complex mixtures such as atmospheric dust, a KBr carrier must be used. Extreme care must be taken in generalizing the airborne state of the identified sodium sulfate. Depending on meteorological conditions, rapid transition occurs while the sodium sulfate is airborne, the sample is in the sampling apparatus during the trip to the laboratory, and while the sample is awaiting pellet pressing. Up to two waters of crystallization can be lost in a 1-hour period. It is difficult to pinpoint the sodium sulfate in the atmospheric aerosol, but through careful consideration of meteorological conditions at the time of sampling, a good estimation is possible. (Author conclusions modified)

23692 APTIC NO. 42910

Rosen, K. M. and S. Yerazunis

THE EFFECT OF HIGH MASS TRANSFER RATES OF FOREIGN MATERIAL ON THE TRANSPORT PROCESSES IN FULLY-DEVELOPED TURBULENT FLOW. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 14p., 1972. 34 refs. (Presented at the American Institute of Aeronautics and Astronautics Thermodynamics Conference, 7th, San Antonio, Tex., April 10-12, 1972, Paper AIAA 72-293.)*

A model was developed to predict the effects of high mass transfer of foreign materials on the transport coefficients in fully developed moderate velocity turbulent flow. Using turbulent diffusivity formulations which follow from the phenomenologically based law of the wall, expressions for relating the high to low transport coefficient were calculated. The solution requires simultaneous evaluation of the conservation of mass and momentum equations because of the dependence of both the molecular and turbulent transport mechanisms on the localized value of density. The effects of foreign gas addition on velocity and concentration profile were also studied. Specifically, the effects of foreign gas addition are generalized to require the known molecular weight of the injected species to evaluate the reduction in the friction coefficient. The predicted results compared favorably with experimental measurements. (Author abstract modified)

23693 APTIC NO. 42402

Rosenberg, C. W. von, Jr. and K. L. Wray

VIBRATIONAL RELATION OF CO BY FE-ATOMS. *Proc. Intern. Shock Tube Symp., 8th, London, England, 1971, p. 28/1-28/10. 11 refs. (July 5-8.)*

Shock tube investigations on iron pentacarbonyl plus argon mixtures are described. Behind incident shocks, immediate decomposition of the Fe(CO)5 was observed to yield Fe and vibrationally cold CO; the CO was then very efficiently relaxed by the FE-atoms. The results are interpreted to yield a relaxation time for CO infinitely dilute in Fe at 1 atm of Ptau (CO,Fe) equivalent to 0.06 atm micro sec for T equal to 1400-2900 K. This is believed to be the first measurement of vibrational relaxation by metal atoms.

23694 APTIC NO. 43673

Scrocco, Marisa

DIPOLE MOMENTS OF SO2 AND O3 CALCULATED FROM INFRARED ABSOLUTE INTENSITY MEASUREMENTS. *Gaz. Chim. Ital., 101(10):787-791, 1971. 10 refs.*

The partial contribution of the bond and lone pair moments to the total dipole moment of the sulfur dioxide molecule was calculated on the basis of a model in which the valence shell orbitals of sulfur and oxygen are thought to have a pseudotrigonal distribution. The experimental data used were the total moment of the molecule and the absolute intensity of its bending vibration. Similar calculations were performed for the ozone molecule.

23695 APTIC NO. 43141

Seely, Ben K.

DETECTION OF CERTAIN IONS IN 10 TO THE MINUS 10TH POWER TO 10 TO THE MINUS 15TH POWER-GRAM PARTICLES. *Anal. Chem., 27(1): 93-95, Jan. 1955. 8 refs.*

The modified spot-test methods described are extensions of a technique previously described for the identification of micron and submicron chloride particles. The technique depended on microscopic observation of chemical reactions in the surface of a gelatin medium sensitized with a mercurous salt. Similar procedures are discussed in detail for the identification of copper, cobalt, nickel, ferrous and ferric ions, sodium, and potassium, as well as iodides and carbonates in particulate matter. The sensitivity of the method permits the identification of masses four to six orders of magnitude smaller than is possible by conventional spot-test procedures as reported in the literature. This technique also enables identification of individual particles in the presence of thousands of other particles of different compositions, and it is not limited to aerosol particles. This method has been used primarily for the study of atmospheric particles, but it may be applied to other fields of study.

23696 APTIC NO. 42931

Selberg, B. P. and J. A. Nicholls

DRAG COEFFICIENT OF SMALL SPHERICAL PARTICLES. *AIAA (Am. Inst. Aeron. Astronaut.) J., 6(3):401-408, March 1968. 29 refs.*

An investigation was undertaken to determine the drag coefficient of small, inert, spherical particles accelerating in a laminar, nonreacting, incompressible continuum flow. The Reynolds number range covered was from 200 to 1700, and particle sizes ranged from 150 to 450 micron. Glass beads, HP 295 ball powder, and sapphire balls were used. The convective flow behind the shock wave in a shock tube was used to accelerate the particles. The diameter and temporal displacement of a single particle were determined by use of a rotating drum camera in conjunction with an oscillating light source. The particle drag coefficient was calculated by using the photographic data, the particle density, the shock speed, the initial temperature and pressure, and the normal shock relations. Experiments with HP 295 ball powder produced drag results that were as much as 85% higher than the standard drag coefficient curve. This increase was found to depend on the relative Mach number of the flow about the particle even though the Mach number was less than 0.3. The glass beads yielded similar results but to a lesser extent. The sapphire balls produced the best results, yielding the lowest drag values, less scatter, and little sensitivity to Mach number. Many possible influences were considered to explain these anomalous results. Photomicrographs showed that the ball powder was very rough and that the sapphire balls were the most smooth. Particles in solid rocket nozzles are rough and hence their drag coefficients are much higher than would normally be the case. (Author abstract modified)

23697 APTIC NO. 43335

Smith, Robert R. and George Priftis

APPLICATIONS OF SYSTEMS ENGINEERING FOR SOLUTION TO SOCIAL AND ECONOMIC PROBLEMS. *Advan. Astronaut. Sci. Suppl., vol. 26:107-143, 1971. 3 refs. (Presented at a Special AAS/AIAA Technical Event, Winrock, Ark., Oct. 30, 1970.)*

The application of aerospace technology to determine the solutions needed for social and economic problems, and the direction to take in obtaining these solutions, is discussed in its potential for the solution of problems in the following fields: transportation, fluid waste, solid waste, air pollution, water pollution, housing, agriculture, and government agencies. The solution to problems in these areas can only be solved when all the variables have been determined. This can be accomplished through the application of systems engineering to the utilization of computer technology in the data handling field. By means of this technology, systems engineering with computers supported collection and reduction and distribution of data will be used to conduct technically credible and comprehensive research and development projects in engineering and program management. The social and economic problems created by environmental pollution should be treated as a single system with each of the contributing elements as an interrelated subsystem. The complex problems of the urban environment would benefit greatly by a systems analysis approach.

23698 APTIC NO. 42915

Sonnichsen, Tim W. and David T. Pratt

A MONTE CARLO MODEL OF TURBULENT MIXING FOR THE PREDICTION OF NO PRODUCTION IN STEADY-FLOW COMBUSTORS. *Preprint, Combustion Institute, Western States Section, 11p., 1972. 15 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72- 8.)*

The Monte Carlo model simulates the random fluctuations that are present in a well-stirred region and allows a prediction of the effect of turbulent fluctuations on production of nitric oxide and other species in the primary zone. Turbulent measurements are used to estimate not only the size of the macro and micro-volumes, but also their rate of appearance and disappearance, and the turbulent mixing characteristics of the entire system. Values for the macro- and micro-scales were obtained from hot-wire anemometer turbulent measurements in a laboratory well-stirred reactor; measurements were made using a DISA constant temperature hot-wire anemometer. The Eulerian correlation function was determined for various locations inside the reactor under cold flow conditions. Both cold and hot-flow laboratory stirred reactors were operated at the same pressure. A stirred-reactor study of methane/air combustion is presently being conducted. The present analysis was used to model this system, and predicted values of temperature and species concentrations were compared with measured values to assess the validity of the mixing model chosen. The results of the Monte Carlo simulation of a cold-flow tracer-response experiment show a concentration of tracer with time which satisfactorily approximates that of a perfectly-stirred reactor. The Monte Carlo model presented appears to be well suited for simulation of dispersed and homogeneous turbulent mixing with chemical reaction in steady-flow combustors. It is a simple and physically realistic model which allows calculation of combustion phenomena for non-premixed as well as premixed reactants, and is unique in its ability to systematically vary and predict the effects on nitric oxide production of coupled fluctuations of temperature, equivalence ratio and concentration.

23699 APTIC NO. 43619

Soo, Shao L.

NON-EQUILIBRIUM FLUID DYNAMICS-LAMINAR FLOW OVER A FLAT PLATE. *J. Appl. Math. Phys., 19(4):545-563, 1968. 18 refs.*

Non-equilibrium fluid dynamics deal with cases where components of a mixture may have significantly different mass velocities or static temperature, or both, as well as different gradients. Some general characters of non-equilibrium laminar flow over a flat plate were explored. A mixture, consisting of a predominating component and a trace component, has the following relationship between the densities: the density of the predominating component is much greater than that of the trace component, and the concentration of the trace component is very nearly equal to the density of the trace component divided by the density of the predominating component. Mathematical analysis reveals that the temperature distribution of the trace component is influenced by the magnitude of the relaxation time for energy transfer from the predominating component to the trace component divided by the relaxation time for momentum transfer from the predominating component to the trace component. In a gaseous system, when the mean free path of collision between the trace component and the principal component is large, the trace component may behave like a rarefied gas, even if the principal component does not. The solutions given were such that the self-consistent nature of non-equilibrium fluid dynamics is simplified; therefore, any number of trace components can be superposed for mathematical analysis.

23700 APTIC NO. 43185

Stewart, P. S. B. and C. J. Restarick

DYNAMIC FLOW ACTIVITIES OF A SMALL SPIRAL CLASSIFIER. *Trans. Inst. Mining Met., vol. 76:C225-C230, 1967. 7 refs.*

The dynamic flow characteristics of a small spiral classifier, operating in closed circuit with a wet ball-mill, were studied by introducing an impulse of tracer solids into the classifier feed and following the amount discharged to overflow and sands as a function of time. Based on analysis of the results, a physical model of the system was developed and a realistic simulation of the dynamic behavior of the classifier was achieved using an analog computer. The existence of four main zones in the active portion of the classifier was confirmed, and the relative rates of movement of various particle sizes; enroute to overflow and sands discharges through these zones, were resolved. Particles reporting to the overflow had mean residence times of approximately 1 min, and differences in particle size had little effect on this value. For solids discharged as sands, residence times ranged from 1.2 min for the coarsest to approximately 2.0 min for the finest. For the sizes which reported predominatly to the overflow, the small fraction discharging with the sands had mean residence times of 2.4 min, independent of size.

23701 APTIC NO. 43436

Swaine, D. J. and R. L. Mitchell

TRACE-ELEMENT DISTRIBUTION IN SOIL PROFILES.

J. Soil Sci., 11(2):347-368, 1960. 32 refs.

The contents of total and extractable trace elements present in Scottish soil profiles are primarily related to the geological parent material from which the soils were derived. Little or no effect within the profile attributable to pedeological factors has been observed in the total contents. The most marked effect on the contents of extractable trace elements, notably cobalt, nickel, copper, manganese, molybdenum, zinc, and lead, is their increased mobilization in conditions of restricted drainage. Very high extractable amounts occur in gleyed horizons of very poorly drained soils. No marked accumulation of trace elements has been observed in the iron pan or illuvial horizons of podzolized profiles. Higher contents of acetic-acid-extractable aluminum occur in soil with unrestricted drainage, the amounts present being of the same order as the exchangeable-calcium contents. Several tables are included showing the distribution of trace elements in Scottish soil profiles. (Author summary modified)

23702 APTIC NO. 42427

Takahashi, Saku

ON THE REACTION OF OXYGEN ATOM WITH ACETYLENE.

Mem. Def. Acad. Japan, 11(4):405-414, 1971. 6 refs.

The reaction of oxygen atom with acetylene was studied by observing the emission spectrum of the flame produced by the reaction in an argon carrier in a fast flow system at total pressure around 2 torr. The emission spectra observed from oxygen atom and acetylene flame were the hydrocarbon flame bands, and the intensity of these flame bands changed with the amount of added acetylene sensitivity. The stoichiometric factor, n equals the concentration of oxygen over the concentration of acetylene, was evaluated experimentally as 2. From this value, a possible mechanism including the initial reaction was derived as follows: (1)C2H2 + O yields C2H2O yields CH2 + carbon monoxide; (2)CH2 + O yields HCO + H; and (3 H + HCO yields H2 + CO. Observations about nearly stoichiometric mixtures were attempted. The rate of the overall reaction is determined by the initial step in which an additional compound C2H2O, is formed. The rate constant for the initial reaction was measured at room temperature as 0.67 times 10 to the minus 13th power cc/molecule/ sec. (Author summary modified)

23703 APTIC NO. 42604

Takahashi, Saku

ON THE REACTION OF OXYGEN ATOM WITH CARBON-DISULFIDE. (PART 1).

Mem. Def. Acad. Japan, 11(2):191-208, 1971. 19 refs.

The reaction of oxygen atom with carbon disulfide in argon were investigated by conventional kinetic techniques in a flow system. The stoichiometry factor n equals the concentration of oxygen over the concentration of CS2 was determined experimentally and its value is 2. From this, the oxidation of CS2 is expressed stoichiometrically as follows: 20 + CS2 yields CO + SO + S. The oxidation rate was evaluated at room temperature by monitoring the formation of sulfur monoxide by kinetic emission spectroscopy. The evaluated rate constant is 2.36 times 10 to the minus 12th power cc/molecule sec. (Author summary modified)

23704 APTIC NO. 42782

Takahashi, Saku

THE REACTION OF ACTIVE NITROGEN WITH ACETYLENE.

Mem. Def. Acad. Japan, 11(4):415-429, 1972. 7 refs.

The reaction of the nitrogen atom with acetylene was studied in a low pressure flow system using a spectroscopic method of chemiluminescence. In the low initial ratios of reactants, the nitrogen concentration to acetylene concentration ratio is about equal to 2; the rate determining step is C2H2 + N yields C2H2N, and the radical C2H2N reacts with active nitrogen to form the end products. At high ratios, the reaction is a chain reaction, started by excited nitrogen molecules, and atoms reacting with acetylene to form hydrogen cyanide and CN-radicals. In these cases, the rate constants are evaluated to be 0.5 to 0.8 times 10 to the minus 13th cc/molecule/sec at low ratios, and 0.9 to 1.4 times 10 to the minus 13th cc/molecule/sec at high ratios. (Author summary modified)

23705 APTIC NO. 42323

Tan, V. A., V. D. Lukin, V. A. Astakhov, and P. G. Romankov

STUDYING THE HYDRODYNAMICS OF A TWO-PHASE FLOW ON A SEPARATORY PLATE OF A CONTACT COLUMN FACILITY.

(Issledovaniye gidrodinamiki v separatsionnoy tarelke kontaktnoy stupenikolonnogo apparata pri dvizhenii dvukhfaznogo potaka). Text in Russian. Zh. Prikl. Khim., 45(4):892-895, 1972. 4 refs.

The hydrodynamics of a two phase (gas or vapor - microspheric adsorbent) flow on a separatory plate of an experimental contact column facility was studied to determine the contribution by the single plates to the total hydraulic resistance of the contact stage. The air expenditure varied from 9 to 75 cu m/hr, and the old phase (zeolite and sand in a fraction of 140-250 micron) expenditure from 14 to 63 kg/sq m/sec. The total hydraulic resistance of the separatory plate, a linear function of the solid phase expenditure, sharply increased with the expenditure at constant gas flow rate. The total hydraulic resistance in two phase system can be regarded as the sum of the resistance of the dry plate plus that due to the presence of the solid phase. While the former component was of minor importance, the second component decreased with increased gas flow rate at constant solid phase expenditure and increased strongly with elevated expenditure at constant gas flow rate, both functions being linear.

23706 APTIC NO. 42662

Tanaka, Ikuzo, Shin Suzuki, Tsuneo Shirai, Nobutoshi Horiuchi, Isamu Shimada, and Saburo Yanagisawa

PANEL DISCUSSION ON POLLUTION AND ANALYTICAL CHEMISTRY - 4TH SESSION, PHOTOCHEMICAL SMOG.

(Kogai to bunseki kagaku ni kansuru paneru toronkai - Dai 4-kai, kokagaku sumoggu). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 21(7):957-977, July 1972. 36 refs.

Photochemistry of smog, measurement of oxidant, photochemical reactions of nitrogen oxides and hydrocarbon, photochemical reaction of sulfur dioxide and hydrocarbons, and the photochemical reaction of automotive emission gas are discussed. Of the four chief air pollutants including carbon monoxide, SO2, hydrocarbons, and nitrogen dioxide, NO2 is the chief cause of photochemical smog. The NO2 is formed from nitric oxide through reaction with CO or hydrocarbon or in chain reaction in which hydroxide is a carrier. The formation mechanism of PAN (peroxyacetyl nitrate) is also given.

Measuring methods of oxidant include ultraviolet absorption spectrophotometry, infrared absorption spectrophotometry, colorimetry, the alkaline potassium iodide method, the iron sulfate ammonium method, the phenolphthalein method, the ozonolysis of olefin method, and the trans-2-butene gas-phase titration method. The measuring instruments available are of the coulometric type and photometric type. Reaction between hydrocarbon and NOx is reviewed, using the data on the effect of hydrocarbon structure on the nitric oxide photooxidation rate, the effect of internal olefin structure on NO photooxidation rate, and the effect of hydrocarbon structure on eye irritation index. Under the photochemical reaction of SO2 and hydrocarbon, the relation between cis-trans isomerization and SO2 was experimentally examined. As for automotive emission gas, its photochemical reaction was studied in a smog chamber in which the gas was exposed to ultraviolet rays.

23707 APTIC NO. 43304

Trent, D. S. and J. R. Welty

NUMERICAL COMPUTATION OF CONVECTION CURRENTS INDUCED BY FIRES AND OTHER SOURCES OF BUOYANCY. *Preprint, Combustion Institute, Western States Section, 20p., 1972. 25 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-18.)*

The power of advanced numerical techniques in computing detailed convection patterns in complex, fire induced recirculating flows is demonstrated. The fundamental equations governing the transport of momentum, heat, and material constituents in turbulent, thermally induced, circulating flows are discussed for two and three dimensional application. Two methods for solving the fluid dynamic equations were considered: the linear momentum transport approach and the vorticity transport approach. Vorticity transport was deemed the most practical approach for finite-difference application and results for axisymmetric, steady-flow plumes in a free environment are presented. Prandtl's mixing length hypothesis was used to describe the plume-generated turbulence, and computed convection currents were in excellent agreement with published data. Results illustrating convection patterns caused by a fire in a vented enclosure are also presented.

23708 APTIC NO. 42932

Ulrich, Gail D.

THEORY OF PARTICLE FORMATION AND GROWTH IN OXIDE SYNTHESIS FLAMES. *Combust. Sci. Technol., vol. 4:47-57, 1971. [illegible] refs.*

Those factors which determine ultimate particle size in the synthesis of pyrogenic silica are discussed. Pyrogenic or fumed silicas are produced commercially through the combustion of a premixed stream of silicon tetrachloride, hydrogen, and air. Because of their small size, silica particles assume translational velocities and collision frequencies characteristic of large gas molecules. When chemical reaction and nucleation times are short, relative to the total formation period, growth approaches a rate which is independent of the early history of the system and is determined solely by the frequency of Brownian collisions. Under these conditions, the logarithm of particle size is directly proportional to the logarithm of growth time. In commercial flames, secondary air is inducted into the flame jet, causing particles to cool below their fusion temperature. Under such circumstances, the growth time, and thus the ultimate particle size, is a strong function of initial flame temperature. Theoretical disappearance rates are formulated using a Brownian collision-coalescence model and are compared with results obtained from a commercial burner operating at a variety of flame temperatures and concentrations. Inspection of the literature suggests that the collision-coalescence mechanism of growth applies to numerous other oxide and carbon forming flames where reactions are fast relative to quench times, supersaturation ratios are high, and particles are small relative to mean-free molecular paths. (Author abstract modified)

23709 APTIC NO. 43169

Ulrich, Gail D.

PARTICLE FORMATION IN HIGH TEMPERATURE SYSTEMS. *Preprint, New Hampshire Univ., Durham, Dept. of Chemical Engineering, 20p., 1970 (?). 28 refs.*

Particles are formed at high temperatures in a multitude of modern industrial processes. In some instances, such as pigment manufacture and flame or plasma synthesis operations, the particle formation is intentional and carefully controlled. In other cases, particles occur as by-products, and when exhausted to the atmosphere, create air pollution. In either event, a basic understanding of the growth process is necessary if particles are to be synthesized into the optimum form for collection from gaseous effluents, are to be of least harm to the respiratory system, or are to be custom synthesized for optimum performance in an end use. The growth of oxide particles at atmospheric pressure, at temperatures above the melting point, and in size ranges smaller than .05 micron is discussed. Under these conditions, aerosol particles behave as free molecules and Brownian collision frequencies can be described by kinetic theory. For a collision-coalescence model, the logarithm of particle size increases directly with the logarithm of growth time. This mechanism of growth is considered to be controlling in many particle-forming combustion systems where chemical reactions are fast compared to quench times, supersaturation ratios are high, and particles are small relative to mean-free molecular paths. Aggregation phenomena and observed electrical effects are also compatible with a collision-coalescence process. (Author abstract modified)

23710 APTIC NO. 42979

Ulrich, William F.

SOLUTIONS FROM SPECTRA. *Ind. Res., 13(6):52-53, June 1971.*

A vital fator in any effort at environmental control is sensitive and reliable surveillance methods that can identify and monitor the development of both desirable and undesirable substances. Analytical instruments based on spectroscopic principles are particularly effective for these activities. Aside from the countless routine colorimetric and spectrophotometric methods for water analysis, spectroscopic techniques are applied to a number of difficult and often spectacular problems, such as the detection and determination of mercury. At present, the determination of trace mercury is best performed by the flameless atomic absorption technique. Phenolics, which account for most of the objectionable odors and tastes in water, commonly are determined as a group either by colorimetric procedures or by their own natural absorbance in the ultraviolet. Total organics, which represent one of the most important indicators of water quality, commonly are determined by an infrared technique. In ontrast to chemical procedures that require hours or even days to complete, the combustion-infrared method an perform an analysis in minutes. Infrared spectra also provide the unique confirmation required for identification of pesticide residues. Possibly the most challenging problem in water quality programs is the detection and measurement of biological species. One promising method for the determination of bacteria and virus is based on the bioluminescence observed when adenosine triphosphate reacts with hydroluciferin in the presence of the enzyme, luciferase. A liquid scintillation counter can be used for measuring chemiluminescence.

23711 APTIC NO. 43211

Wailes, P. C., H. Weigold, and A. P. Bell

SULPHUR DIOXIDE INSERTION REACTIONS WITH DICYCLOPENTADIENYLTITANIUM AND -ZIRCONIUM ALKYL AND ARYL COMPOUNDS. *J. Organometal. Chem., 33(2):181-188, Dec. 1971. 10 refs.*

Sulfur dioxide reacts in the expected manner with alkyl- and aryldicyclopentadienyltitanium compounds to yield the red monomeric O-sulfinates (pi-C5H5)2Ti(O2SCH3)2, (pi-C5H5)2Ti(O2SCH3) C1, and (pi-C5H5)2Ti(O2SC6H5)2. With dicyclopentadienylzirconium compounds, the SO2 inserts into the zirconium-alkyl bond and into the zirconium-cyclopentadienyl bond in certain cases, even though the cyclopentadienyl group is pi-bonded to zirconium. The preparations of the O-sulfinates (pi-C5H5(C5H5SO2)Zr(O2SCH3)Cl)n, (pi-C5H5(C5H5SO2)ZrO)n and (pi-C5H5(C5H5SO2)ZrSO3)n are reported. (Author abstract)

23712 APTIC NO. 43597

Walker, D., P. Milne, Joan Guppy, and Judith Williams

THE COMPUTER ASSISTED STORAGE AND RETRIEVAL OF POLLEN MORPHOLOGICAL DATA. *Pollen Spores, 10(2):251-262, 1968. 6 refs.*

To serve the needs of research into the vegetation history of New Guinea and Australia a computer-assisted aid to the identification of the pollen grains of these regions has been devised. In all, 149 numbered categories are available, each identifying a particular morphological attribute or a limited range of such attributes. The categories are divided into 11 sections which are: main class of pollen grains, number and gross distribution of apertures, structure of aperture areas, basic shape, sculpture of the exine, uniformity in distribution of structure elements, structure of the exine, quantitative categories including maximum length and breadth of the grain, range of index polaris in four size classes, and the size range of sculpture elements. An unrecognized pollen grain found during the examination of a fossil preparation, or other sample of a variety of grains, is described in code category numbers for a FORTRAN program run on a Control Data 3600 computer. The printed output resulting from an interrogation provides a list of the 15 or 20 taxa from the reference store best fitted to the description. Limitations and possible areas for improvement in the system are discussed.

23713 APTIC NO. 43244

Weaver, Jack N. and Darryl J. von Lehmden

AN EVALUATION OF THREE NEUTRON ACTIVATION ANALYSIS METHODS FOR MERCURY IN COAL. *Preprint, American Chemical Society, Washington, D. C., p. 16-28, 1972. 1 ref. (Presented at the American Chemical Society, National Meeting, 163rd, Boston, Mass., April 9-14, 1972.)*

Neutron activation analysis of mercury in coal was evaluated in a series of tests. Three variations of NAA were examined: instrumental NAA using a 3 times 10 to the 13th n/sq cm-sec irradiation and counting on a lithium drifted germanium coaxial detector; a 3 times 10 to the 13th n/sq cm-sec irradiation followed by radiochemistry and counting on a sodium iodide detector; and a 3 times 10 to the 13th n/sq cm-sec irradiation and counting on a Ge(Li) low energy photon detector. Sampling methods, preparation, individual techniques, nuclear parameters, operating procedures, and experimental results are reviewed. Of the three variations, the third technique was determined the most promising for future analysis with accurate, inexpensive, and instrumental NAA.

23714 APTIC NO. 42701

Westley, Francis

CHEMICAL KINETICS IN THE C-O-S AND H-N-O-S SYSTEMS: A BIBLIOGRAPHY - 1899 THROUGH JUNE 1971. *National Bureau of Standards, Washington, D. C., Chemical Kinetics Information Center, NBS Special Pub-362, 69p., April 1972. 319 refs.*

GPO: C 13.10:362

This bibliography lists papers and reports on the gas phase reaction kinetics in the carbon-oxygen-sulfur, carbon-sulfur, and hydrogen-nitrogen-oxygen-sulfur systems. The material is presented in two ways: by reaction, listing each pertinent article and in a general reference list, arranged alphabetically by first author. Categories of reactions listed are: reactions of carbon oxysulfides, reactions of carbon sulfides, and reactions of sulfur, sulfurhydrides, and sulfur oxides. The articles have been selected from the files of the Chemical Kinetics Information Center. The criterion for inclusion of an article is that there must be some new information on the reaction, when the article in question is compared with the chronologically preceding ones. Most of the reactions listed in this bibliography show a chemical change. Some of these show a photolytic, chemiluminescent or energy transfer process that occurs simultaneously with chemical change. In addition, there are a few reactions that are simply collisional energy transfer or photoexitation processes. Three lists of critical reviews dealing with the above reactions are included. Three-hundred and seventeen papers covering 240 reactions are listed. The period covered extends from 1899 through June 1971.

23715 APTIC NO. 42425

Willis, C., A. W. Boyd, and P. E. Bindner

PRIMARY YIELDS AND MECHANISMS IN THE RADIOLYSIS OF N2O FROM HIGH INTENSITY ELECTRON PULSE IRRADIATIONS OF N2O-O2 MIXTURES. *Can. J. Chem., 50(10):1557-1567, May 15, 1972. 83 refs.*

The yields of nitrogen, oxygen, and ozone were measured from the Febetron radiolysis of nitrous oxide-oxygen mixtures with and without sulfur hexafluoride. A mechanism consistent with the yields from 0-100% O2 and with known ionic abundances and reaction rate data was derived. The major features of this mechanism are both dissociative neutralization of N2O(+) and excitation of N2O to give N2(Chi(1)Sigma) and O(1D) and smaller amounts of N2(Beta(3)Pi) and O(3P). The large yields of nitric oxide and N2 observed are mainly due to reaction of O(1D) with N2O to give both N2 and O2 and NO. (Author abstract modified)

23716 APTIC NO. 43618

Wilson, A. and E. G. Barber

PFA UTILIZATION IN THE UNITED KINGDOM. *Bureau of Mines Information Circ. 8488, 1970: 144-150, 1970. (Presented at the Ash Utilization Symposium, 2nd, Pittsburgh, Pa., March 10-11, 1970.)*

The major use of pulferized fuel ash (PFA) in the United Kingdom, accounting for more than 50% of sales, is as a load-bearing fill material. This category includes a number of uses, such as the construction of road embankments, airport runways, and the general raising of levels for building sites. The second largest use is for blocks and bricks. The blocks are made from PFA and cement and are aerated by the addition of aluminum powder which evolves hydrogen gas with the alkaline mix. The process is completed by autoclaving and produces a lightweight, load-bearing, thermally insulating block which is extensively used for the inner leaf and partition walls of domestic and industrial buildings. Density is approximately 50 lbs/cu ft with a compressive strength of 600 lbs/sq in. PFA is also used in the production of a lightweight aggregate by sintering and in concrete mixes. Methods used in marketing and publicity for PFA are discussed.

EFFECTS-HUMAN HEALTH

23717 APTIC NO. 42463

Environmental Protection Agency, Rockville, Md., Office of Air Programs and Environmental Protection Agency, Research Triangle Park, N. C.

HEALTH HAZARDS OF LEAD. *Preprint, 20p., April 27, 1972. 43 refs.*

All relevant medical and scientific evidence available to the Environmental Protection Agency as of January 1, 1972 on the health hazards of airborne lead is summarized. Information is also provided on sources of airborne lead and lead levels in the environment. The available data indicate that, though the amounts of lead ingested in the diet generally are greater than the amounts inhaled, the body absorbs a greater percentage of inhaled lead (30% or more) than of ingested lead (about 10%). Human blood lead levels are the most frequently used index of human exposure to environmental lead; however, other tissues may provide a more accurate index of total body burden, particularly where exposure levels are relatively low. Human blood lead levels begin to rise appreciably with exposure to airborne lead concentrations in excess of 2 micrograms/cu m. Elevated lead intake for periods as short as 3 months is sufficient to produce an increase in blood lead levels. Average blood lead levels tend to be higher among urban residents than among rural residents and among certain occupational groups more than others. Body burdens of lead, as measured by bone lead concentrations, increase with age at least until age 40 and probably thereafter. The activity of certain enzymes involved in heme syntheses is inhibited at blood lead levels significantly below those associated with clinical lead poisoning. Though ingestion of leaded paint clearly is the principal cause of lead poisoning among children, the high concentrations of lead in urban street dust are another potential source of lead intake. Precipitation samples from 32 locations in the U. S. showed a positive correlation between gasoline consumption and lead content of precipitation.

23718 APTIC NO. 42658

MERCURY IN THE ENVIRONMENT. *Med. J. Australia, 1(3):93-94, Jan. 15, 1972.*

Mercury metal presents a hazard in itself; many cases of poisoning have been reported among thermometer fillers, and even dentists and their assistants are at some risk from it. Far more important, however, is the transformation of mercury residues into methyl mercury by microorganisms at the bottoms of lakes and seas. Methyl mercury is an insidious poison whose primary target is nervous tissue. It is possible that there is no safe threshold for mercury; very small exposures to toxic substances may produce behavioral changes which only the most sophisticated experimental techniques can reveal. Mercury is a persistent poison, and much of the mercury absorbed as a result of breathing the vapor or ingestion is retained for long periods. The central focus of the environmental concern is on the neurotoxicity of methyl mercury and its accumulation in food chains, particularly in fish and water fowl. In Australia, mercury contents between 0.15-0.35 mg of mercury/kg of canned tuna fish, some imported and some Australian canned, were discovered.

23719 APTIC NO. 42813

Nagoya Municipal Bureau of Public Nuisance Control (Japan)

PROGRESS REPORT ON 1970 INVESTIGATION ON RESPIRATORY DISEASES OF SPECIAL DISTRICT INHIBITANTS. *(Showa 45 nendo tokutei chiku jumin kokyukikei shikkan kenko chosa hokoku). Text in Japanese. 5p., 1971 (?).*

Residents in five districts in Nagoya were tested on their awareness of pollutions and examined to determine the effects of pollution on health. Nearly 60% of the residents were aware of the state of environmental pollution, with one areas as high as 87.6%. Forty percent of the residents felt that the pollution had affected their body conditions. Significant differences were determined between highly polluted areas and the control area; 3.2% of the residents had obstructive lung diseases, including asthma and pulmonary emphysema.

23720 APTIC NO. 42922

EFFECT OF AIR POLLUTION ON HEALTH. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 4, p. 31-47. 51 refs.*

Although there is ample documentation for the disastrous health consequences of the severe acute air pollution episodes, there is only limited statistical evidence on the relationship to chronic health impairment of levels of contamination presently found even in the more heavily polluted cities and industrial areas. A recent study by the Public Health Service correlated mortality with an urbanization index which included such factors as density of population and sources of pollution. A correlation was found for four causes of death: cancer of the respiratory system, cancer of the gastrointestinal tract, arteriosclerotic heart disease, and myocardial degeneration. The incidence of bronchitis against sulfur dioxide concentration is considered, as well as the effect of pollution on asthma and other epidemiological data. Some of the physiological considerations controlling the way in which the respiratory system handles toxicants and its responses to them are reviewed, including the nature of the tissues lining the respiratory tract, particle deposition, particle size, and biological interaction or synergism. Some specific pollutants are listed with the concentrations at which they generally occur and their threshold limit values; these include sulfur oxides, nitrogen oxides, ozone, hydrocarbons and other organic compounds, heavy metals, and carbon monoxide. California air quality standards are discussed, and the relationship of cancer to air pollution is considered.

23721 APTIC NO. 43318

Akita Prefecture (Japan), Dept. of Environmental Health

HEALTH SURVEY CONCERNING AIR POLLUTION. *(Taikiosen ni kansuru kenko chosa ni tsuite, Akita-shi Barajima chiku, Hachimori-chiku). Text in Japanese. 51p., March 31, 1972.*

An investigation has been made to determine the effects of air pollution on the inhabitants of the Barajima Area, Akita City, and Hachimori Town in Akita Prefecture. Control areas were also selected. Questionnaires showed that twice as many people complained of impairment in the nose and throat in the Barajima Area and three times as many in Hachimori Town as in control areas. An examination revealed that more from polluted areas needed a secondary examination, and the proportion to the total population studied was 8.4% in Barajima Area and 1.4% in control areas. The secondary examination, however, did not clarify cause and effect relationships between air pollution and health impairment, because environmental, age, working conditions, and other complicated factors seemed to be involved. Supplementary data on the health survey examined age groups in the Barajima Area. And it is desirable from now on to maintain a continuous health and environmental survey on these areas.

23722 APTIC NO. 43667

Arkhipova O. G., T. Ya. Medved, M. V. Rudomino, and M. I. Kabanchik

ACCELERATION OF A BERYLLIUM EXCRETION BY PHOSPHYCIN. *(Uskoreniye vyvedeniya berilliya fosfitsinom). Gigiena Truda i Prof. Zabolevaniya, vol. 11:19-23, March 1967. 6 refs. Translated from Russian. 8p.*

A study was conducted to investigate the protective properties of phosphycin, a disodium salt of ethylene-diamino-bis-isopropylphosphenic acid, in regard to beryllium. The effects of phosphycin and ammonium salts of aurin tricarbonic acid were also compared. Experiments were conducted on 25 albino mice and 15 albino rats. Beryllium (7) was used for the research; it was administered in the form of Be(7)Cl2. After administration of Be(7)Cl2, 0.3 ml of a 10% phosphycin solution and 0.4 ml of a 1% solution of ammonium salts of aurin tricarbonic acid were given to the animals. The activity of the animals bodies was measured by gamma radiation, by a comparison with the original activity as measured immediately after administration of Be(7)Cl2. Phosphycin forms a stable complex with beryllium and accelerates excretion of Be(7) from the organism. The increased excretion causes a lowering of the Be(7) content in the internal organs and bones.

Phosphycin does not chelate calcium in the organism; this attests to its high selectivity. The beryllium-aurin tricarbonic acid complex was unstable and split apart in the organism.

23723 APTIC NO. 42941

Armstrong, Robert D., Leonard J. Leach, Phillip R. Belluscio, Elliott A. Maynard, Harold C. Hodge, and James K. Scott

BEHAVORIAL CHANGES IN THE PIGEON FOLLOWING INHALATION OF MERCURY VAPOR. *Am. Ind. Hyg. Assoc. J., vol. 24:366-375, July-Aug. 1963. 9 refs.*

Pigeons, motivated by food deprivation, were trained to peck on a key to obtain a reward, food. These birds were then conditioned to a multiple FI-15, FR-60 schedule of reward. Thus for a pigeon to obtain food in the presence of the red light it was required to respond sixty times, abbreviated FR-60; with the green light, a pigeon was required to respond only once after a 15-min period of time had elapsed, abbreviated FI-15. When stable behavior had developed on this schedule, eight of the 11 trained birds were exposed to mercury vapor. Following inhalation of mercury at about 17 mg/cu m, marked changes in behavior occurred, as measured by a decrease in the average rate of responding in both the fixed ratio and fixed interval portions of the multiple schedule. A return to normal behavior patterns occurred after mercury exposure was terminated. The three pigeons used as controls showed no appreciable change in behavior during the entire experimental period. The results indicate the feasibility of using operant behavior analysis as a tool for investigating some of the chronic effects of mercury poisoning on the behavior of an experimental animal. (Author abstract modified)

23724 APTIC NO. 42705

Arsdell, Prudence M. Van

LIFE AND DEATH IN AN OIL REFINERY. PART 1. *Petrol. Engr., 21(6):C26-C34, June 1949. 25 refs. Part 2. Ibid., 21(7):C30-C34, July 1949. 19 refs.*

Every year for the past 10 years, the record shows that an average of 110 men have died in the petroleum industry; the refining division is charged with 35% of this yearly total. In addition, lost time injuries in the refinery averaged 2209 per year for this 10-year period. Types of accidents occurring within the refinery are indicated. Although the more common accidents such as falls, cuts, and burns have taken their toll, it is important to recognize the nature of the physiologic reactions that can result from the many different phases of petroleum processing, and to provide for the alleviation or elimination of such dangers. Skin irritation due to crude petroleum handling and storage is mentioned, as well as acute and chronic poisoning due to hydrogen sulfide and hydrocarbon emissions. The effects of carbon monoxide, nitric oxide, and metallic fumes in tank repairing are also indicated. Safety measures are cited. Other problems connected with the pumping and distribution of hydrocarbon products to the various refinery areas are considered in Part 2. Reactions to high temperatures, catalysts, organic sulfur compounds and other crude oil distillates, various hydrocarbons, and gasoline products are included. Skin disorders from the various oil fractions are described.

23725 APTIC NO. 43669

Bakacs, Tibor

URBANIZATION PRODUCED HYGIENE DAMAGE IN BUDAPEST. *(Urbanizacios higienies artalmak Budapesten). Text in Hungarian. Budapesti Kozegeszsegugy, 1(2):33-39, 1969.*

Health problems in Budapest are outlined with regard to air pollution, water supply, waste disposal, and the use of sedatives. The air pollution level in Budapest is comparable to that in other large cities and partly due to the fact that more than 40% of the Hungarian industry is centralized in the capital. Since the changeover to better energy sources or central and long-distance heating and the introduction of improved heating techniques, the pollution level has stopped increasing, and abatement can be expected in the near future. Dust sedimentation rates of 103 g/sq m/yr, aerosol concentrations of 0.65 mg/cu m, and sulfur dioxide concentrations of 0.24 mg/cu m were measured in the period 1960 1966. Lung cancer mortality shows a strong upward trend partly due to carcinogenic components in emissions from combustion processes.

23726 APTIC NO. 42394

Barrios del Risco, Pedro

INDICATIONS OF CARBON MONOXIDE EFFECTS IN THE CENTRAL NERVOUS SYSTEM, INDEPENDENT OF THE HEMOGLOBIN BLOCK. *(Hinweise einer Wirkung des Kohlenmonoxids auf das Zentralnervensystem, unabhaengig von der Haemoglobin-Blockade). Text in German. Staub, Reinhaltung Luft, 32(4):164-166, April 1972. 21 refs. (Presented at the VDI (Verein Deutscher Ingenieure) Clean Air Maintenance Committee, Carbon Monoxide Symposium, Duesseldorf, West Germany, Oct. 28 and 29, 1971.)*

Effects of low carbon monoxide concentrations on the central nervous system of cats were investigated. Carbon monoxide in concentrations of 250 ppm (maximum carbon monoxide hemoglobin level 18.5%) and 60 ppm (maximum COHb level 4.5%) had excitatory effect on both the monosynaptic and polysynaptic reflexes of immobilized decerebrated cats. The results which cannot be fully explained from the hypoxic effect of CO only, indicate the possibility of functional alterations in the central nervous system even with low blood carboxyhemoglobin content. Intravenous DOPA (L-3-3,4-dihydroxyphenylalanine) injections inhibited the excitatory effect of CO on the flexion reflexes of cats exposed to CO in concentrations of 1330 and 1630 ppm, while the above effect failed to occur when pure oxygen containing 3% carbon dioxide was inhaled. The results indicate that the enzymes necessary for the adequate function of the inhibitory system (tyrosine hydroxylase, DOPA decarboxylase, and dopamine-beta-hydroxylase) may be disturbed by CO effect. This again would indicate a specific effect, independent of the hemoglobin block, of CO on the central nervous system.

23727 APTIC NO. 43251

Bordier, Henry

PHYSIOLOGICAL ACTION OF MERCURY VAPORS ON MAN, AFTER WORK OF PROF. MERGET. *(Action physiologique des vapeurs de mercure sur l homme d apres les travaux du Professeur Merget). Text in French. J. Med. Bordeaux, no. 33:811-817, Nov. 30, 1936. 6 refs.*

Studies on the physiological action of mercury vapors on man are reviewed. Mercury released vapors at all temperatures including -44 C. A method, applying an ammoniacal solution of silver nitrate on white paper, was developed for the detection of mercury vapors. While mercury vapors were detected in a quicksilvering shop, no troubles among workers, except for those having worked there for at least 20 years, were observed. Chronic inhalation of mercury vapors over 8 hours daily did not impair the health of the test person, and mercury traces in secreta and excreta continued to be present over 3 weeks after the experiment ended. Mercury vapors penetrated the pulmonary epithelium and entered the blood in metallic gaseous phase without combining with it. The metallic mercury is then transferred from the blood to tissues and eliminated, particularly through rine, without forming soluble salts. Mercurial ointments, harmless to intact skin, act through their vapors entering the lung. The rates of absorption of oxygen and mercury vapor in the lung were assumed to be the same, which permitted the amount of mercury absorbed by the lung during a given period of time to be calculated. A new mercurial ointment, having no immediate contact with the skin, and thus emitting vapors with a temperature well below that in the oral cavity, was developed to avoid mercurial stomatitis as caused by conventional ointments through condensation of mercury vapors on teeth.

23728 APTIC NO. 43643

Bordier, H.

ACTION OF MERCURY VAPORS ON MAN, AFTER WORK OF PROF. MERGET. *(Action des vapeurs mercurielles sur l homme. D apres les travaux de Merget). Text in French. Paris Med., no. 2:130-136, Aug. 1936. 3 refs.*

Studies on the effects of mercury vapors on man are reviewed. Though fairly high mercury vapor concentrations in a quicksilvering shop were detected, hardly any physiological alterations in the workers were observed. A few workers, having been employed there for 20 years or more, developed tremors. Chronic inhalation of mercury vapors over 8 hours daily did not impair the health of the test person, and mercury traces in secreta and excreta continued to be present over 3 weeks after the experiment ended. Mercury vapors penetrated the pulmonary epithelium and entered the blood in the gaseous phase, without forming compounds there. Metallic mercury is the carried by blood to the tissues and eliminated, mainly through urine, without forming soluble salts. Mercurial ointments, harmless to intact skin, acted through their vapors entering the lung only. This fact led to the development of a new mercurial ointment which, having no immediate contact with the skin, therefore emitting vapors with a temperature well below that of the oral cavity, caused no stomatitis due to the condensation of mercury vapors on teeth.

23729 APTIC NO. 42903

Brieger, Heinrich

CHRONIC CARBON DISULFIDE POISONING. *J. Occupational Med. (Ottawa), 14(2):123-124, Feb. 1972. 23 refs.*

Exposure to carbon disulfide in some parts of the European viscose rayon industry is still considered a major health hazard. Three main manifestations of occupational CS2 poisoning have been described: toxic psychoses originally observed in rubber workers exposed to extremely high concentrations of CS2, but still occurring in unsafe rayon plants; polyneuritis due to long-extended lesser exposure; and carbon disulfide atherosclerosis. In experimental studies, vascular changes in the brains of dogs were found, consisting of proliferation of the endothelium and thickening and hyalinization of the cortical arterioles. At the present time coronary heart disease appears to be the main concern of the industrial physicians in the European viscose rayon industry. The results of the first comprehensive statistical study in three plants in England and Wales covering the period from 1933 to 1962 have been summarized as follows: 42% of 223 deaths of male workers exposed to CS2 were certified to coronary heart disease, compared with 24% of the deaths in the other workers of the same age, and 17% of the deaths in other local men. Recent studies have shown that chronic CS2 poisoning interferes with the vitamin B6 metabolism, but a dietary supplement of vitamin B6 does not prevent neuropathy. Actual knowledge of another form of CS2 poisoning, carbon disulfide atherosclerosis is fragmentary. The blood concentration of lipids, the inhibition of the lipolytic activity of the arterial wall, and the cholesterol content of the wall resemble the findings in experimental antherosclerosis.

23730 APTIC NO. 42737

Calvery, Herbert O.

CHRONIC EFFECTS OF INGESTED LEAD AND ARSENIC. *J. Am. Med. Assoc., 111(19):1722-1729, Nov. 5, 1938. 34 refs. (Presented at the American Medical Association, Annual Session, 89th, San Francisco, Calif., June 17, 1938.)*

The minimum amounts of lead and arsenic were determined that, when ingested periodically, would cause effects which could be attributed directly to these elements. Rats and dogs were used as experimental animals. Since it was essential to know the effect of lead and arsenic separately as well as in combination, the salts selected for initial investigation were lead arsenate, calcium arsenate, lead acetate, and arsenic trioxide. The concentrations of these in the diets ranged from a fraction of a milligram to several hundred milligrams per kilogram. There was definite storage of lead in all organs and tissues examined at all levels fed. The storage of arsenic was also shown, even at the lowest levels fed. Variation of the calcium content from a low level approximating that of a large percentage of the human dietary to a higher level markedly influenced the storage and toxicity of lead, and a variation in the calcium to phosphorus ratio influenced the storage of arsenic. Calcium arsenate was more toxic and caused greater storage than did arsenic trioxide at the same level. There was no difference observed in the toxicities of lead acetate and lead arsenate when fed at the same relatively low levels, but at high levels the lead arsenate was the more toxic. Even at the lowest level of added lead, there was a significant effect on the growth rate of male rats and on both males and females at higher levels. In some cases there was also an influence on the intake of food. No significant differences were noted between the control and the experimental rats in either the P1 or the F1 generations on the fertility and fecundity. Both lead and arsenic are transferred from the mother s tissues to the fetus and lead is transferred in the milk. Even at the lowest levels of the intake of lead (0.61 ppm) the average concentration of lead of a large number of newborn animals was the same as that of the diet of the mother.

23731 APTIC NO. 42740

Campbell, Kirby I., William M. Busey, Niell K. Weaver, James A. Taylor, and Alexis A. Krumm

BIOLOGICAL EFFECTS IN ANIMALS CHRONICALLY EXPOSED TO LEAD CHLOROBROMIDE ATMOSPHERES. *Hazleton Labs., Inc., Vienna, Va., Inhalation Toxicology Dept., Coordinating Research Council Contract CAPM-6-68, 21p., 1971 (?). 20 refs.*

The biological and possible synergistic effects of chronic exposure to a polluted atmosphere on groups of monkeys were exposed virtually continuously for 104 weeks, in steel and glass inhalation chambers, to atmospheres characterized by respirable lead chlorobromide particulates alone and in simple combination with nitrogen dioxide, carbon monoxide, or sulfur dioxide were investigated. Nominal concentrations were PbClBr at 0.6 mg/cu m, NO2 at 0.5 ppm, CO at 67.6 ppm, and SO2 at 10 ppm. A matching group, exposed only to filtered room air, served as controls. Various clinical and physiologic determinations were performed prior to and periodically throughout the exposure period, and histopathologic evaluations were conducted terminally at sacrifice. Compared to controls, all groups exposed to atmospheres containing PbClBr alone or in combination exhibited increased blood lead levels occurring early and sustaining throughout the exposure; corresponding elevations of urinary coproporphyrins and delta aminolevulinic acid; reduced erythrocyte osmotic fragility; and nephropathy characterized by dilatation and epithelial cell degeneration in the proximal convoluted tubules, with cytoplasmic vacuolation, nuclear vesiculation, intranuclear inclusions, and disrupted borders. Elevated terminal blood levels and slightly increased renal pathology were also observed in corresponding groups of rats similarly exposed for 52 weeks in the same atmospheres.

23732 APTIC NO. 43337

Cernik, A. A. and M. H. P. Sayers

DETERMINATION OF LEAD IN CAPILLARY BLOOD USING A PAPER PUNCHED DISC ATOMIC ABSORPTION TECHNIQUE. APPLICATION TO THE SUPERVISION OF LEAD WORKERS. *Brit. J. Ind. Med. (London), 28(4):392-398, 1971. 10 refs.*

The presence of lead in blood is the most incontrovertible evidence of absorption. Previously, the need for venepuncture has limited lead determination in the supervision of industrial workers. Micro-methods, using atomic absorption spectrophotometry (AAS), have made possible the development of a sufficiently reliable test using a drop of blood, obtainable by ear prick, for use in the field for screening purposes. A microsampling method by AAS is compared with a routine polarographic procedure (POL) using venous blood. The pipetting of microliters of blood can be eliminated by spotting the blood onto filter paper, allowing it to dry in air, and then using a punched-out standard disc of dried blood for analysis. Correlation of this method (PD) with the micro-sampling technique (AAS) is good. The PD method using capillary blood also correlates acceptably with the micromethod using venous blood. A pilot field study using capillary blood estimated by the PD technique showed that, with this method, blood can be collected by ear prick in factories for monitoring workers in the lead industry. (Author abstract modified)

23733 APTIC NO. 43221

Cholak, J. and D. M. Hubbard

DETERMINATION OF MAGANESE IN AIR AND BIOLOGICAL MATERIAL. *Am. Ind. Hyg. Assoc. J., 21(5):356-360, Oct. 1960. 9 refs. (Presented at the American Industrial Hygiene Association, Annual Meeting, 21st, Rochester, N. Y., April 25-28, 1960.)*

Analytical efforts were directed toward the determination of manganese in the urine and blood of persons employed in the manufacture of cyclopentadienyl-manganese-tricarbonyl (an additive to motor fuels). The spectrochemical approach for the determination of Mn was modified so that trace concentrations normally present in the blood and urine could be determined with precision. With the modification, Mn could be extracted free from most ions and concentrated into a volume of 1 ml of solution. The modified spectrochemical method is capable of detecting 0.05 micrograms of Mn/ml of solution. Special reagents considered were: ammonium citrate solution, acetate buffer solution, sodium diethyldithiocarbamate solution (aqueous), triple-distilled water, ammonium hydroxide (metal-free), chloroform, standard Mn solution, buffer and internal standard solution, and cupferron solution (aqueous). Manganese may be removed from the air by methods using impingement, electrostatic precipitation, or filtration through suitable fibrous media. Results of the sampling indicate that the mean concentration for a group of subjects was 2.75 micrograms/l of urine and 4.58 micrograms/100 g of blood. The average concentration of Mn in city air is 0.2 micrograms/cu m, but it may range from 0.05 -5.0 micrograms/cu m. The urine of persons exposed to Mn may show concentrations of several hundred micrograms/l of urine.

23734 APTIC NO. 42736

Clark, G. L. and L. E. Holly

X-RAY ANALYSIS OF FOUNDRY DUSTS. INTERPRETATION OF RESULTS AND CORRELATED MEDICAL OBSERVATIONS. *Anal. Chem., 26(9):1418-1420, Sept. 1954. 6 refs. (Presented at the American Chemical Society, National Meeting, 123rd, Los Angeles, Calif., 1953.)*

An intensive study was made in all sections of a large midwestern steel foundry of the concentrations and compositions of dusts which may constitute a hazard upon inhalation to the workers, especially in development of silicosis. Since alpha-quartz is the established cause of this disease, quantitative analysis of dusts must be made by x-ray diffraction techniques. Two sets of dust samples collected from the same areas, one a year after the other, were analyzed on two different Geiger diffractometers by two observers. Iron was determined chemically and by fluorescent spectral analysis in all the dust samples to ascertain any lung effects defined as siderosis. Dusts varied in quartz content from 0 to more than 80%, and in general the amount of iron varied inversely. Since many workers in the foundry had been employed for more than 16 years in the same duties and the same areas and since lung radiographs periodically made over a period of 16 years were available for each man, it was possible to study the development and progression of evidence of silicotic nodulation and of siderotic changes, supposedly benign, which are often difficult to distinguish from silicosis, as related to the hazard of the particular occupation. The effects of ventilation and of aluminum dust therapy were thus ascertained. (Author summary modified)

23735 APTIC NO. 42708

Cohen, A., C. Nelson, S. Bromberg, M. Pravda, E. Ferrand, and G. Leone

SYMPTOM REPORTING DURING RECENT PUBLICIZED AND UNPUBLICIZED AIR POLLUTION EPISODES. *Preprint, American Public Health Assoc., New York, 23p., 1971. 25 refs. (Presented at the American Public Health Association, Annual Meeting, 99th, Sept. 17, 1971.)*

Three New York City communities alike in socioeconomic status but different in air pollution exposure were studied. Telephone surveys were conducted of 100 families during publicized and unpublicized periods of high air pollution, and during a control period of low air pollution. Each subject family was asked if any family member had experienced eye irritation, throat irritation, cough, shortness of breath, chest pain, or chest burning in the previous three days and whether he had to restrict his activity or visit a doctor because of these symptoms. During both publicized and unpublicized incidents, symptoms and medical visits increased significantly over the control. The data indicate that irritative symptoms may significantly increase when sulfur dioxide levels exceed 0.11 ppm and suspended particulate levels exceed 145 micrograms/cu m for several days.

23736 APTIC NO. 43574

Cohen, Ellis N., J. Weldon Bellville, and Byron W. Brown

ANESTHESIA, PREGNANCY, AND MISCARRIAGE: A STUDY OF OPERATING ROOM NURSES AND ANESTHETISTS. *Anesthesiology, 35(4):343-347, Oct. 1971. 19 refs.*

The possible relationship between spontaneous miscarriage and exposure to the operating room was evaluated through personal interviews with 67 operating room and 92 general duty nurses. The results indicate that from 1966-1970, 29.7% of pregnancies in operating room nurses ended in spontaneous miscarriage, compared with only 8.8% in the control group. A similar pattern was observed in a second study of 50 anesthetists and 81 physicians practicing in specialties other than anesthesia. Between 1965 1970, the anesthetists evidenced a 37.8% spontaneous miscarriage rate, compared with 10.3% in the control group. Miscarriages occurred earlier in both operating room nurses and anesthetists compared with their control groups (eighth versus tenth week). These results suggest a fetal lethality, possibly due to the anethetic gases, although the studies do not incriminate any specific anesthetic agent or establish a cause-effect relationship.

23737 APTIC NO. 42399

Colmant, Hans Joachim

THE ACTION OF LOW CARBON MONOXIDE CONCENTRATIONS ON THE SLEEP AND AWAKE BEHAVIOR OF THE ALBINO RAT. *(Ueber den Einfluss niedriger Kohlenmonoxid-Konzentration auf das Schlaf-Wach-Verhalten der Albinoratte). Text in German. Staub, Reinhaltung Luft, 32(4):158-160, April 1972. 12 refs.*

The effect of low concentrations of carbon monoxide on the sleep and waking behavior of the albino rat was investigated. A concentration of 750 ppm inhaled over a period of 4 hr resulted in a total disorganization of the normal pattern. Exposure to 500 and 300 ppm CO for 5 hr effected a significant decrease of REM phase sleep. Inhalation of 250 ppm during 4 days still reduced paradoxal sleep but returned it to normal within 24 hr; experiments with 100 ppm for the same time gave no statistically valid results.

23738 APTIC NO. 43149

Corn, Morton and Eric B. Sansone

ASSESSMENT OF INHALATION HAZARDS ABOARD INLAND RIVER TOWBOATS. *Am. Ind. Hyg. Assoc. J., vol. 32:313-318, May 1971. 8 refs.*

Three inland river towboats were surveyed for inhalation hazards to the crew by dividing the vessels into five air zones. During vessel operation samples were obtained for carbon monoxide, sulfur dioxide, hydrogen sulfide, nitrogen oxides, hydrocarbons, suspended particulate matter, and oil mist throughout a 24-hr period. Survey sampling methods and analytical methods are described. Results of the surveys are presented in terms of pollutant concentrations in the designated air zones: Pilot House, Captain s Cabin, Engine Room, Galley, and Lounge. Analyses of samples revealed that in all zones the concentrations of pollutants were well below the threshold limit values for workplaces, as recommended by the American Conference of Governmental Industrial Hygienists. (Author abstract modified)

23739 APTIC NO. 43252

Coudray, P., M. Serise, and P. Freour

EPIDEMIOLOGICAL STUDY ON CHRONIC BRONCHITIS AND RESPIRATORY TROUBLES. PREVALENCE STUDY ON A RANDOM SAMPLE OF 30-70 YEARS OLD FEMALES. *(Recherche epidemiologique sur les bronchites chroniques et les insuffisances respiratoires. Etude de prevalence dans un echantillion de femmes de 30 a 70 ans). Text in French. Rev. Tuberc. Pneumol. (Paris), 33(6):769-780, 1969. 9 refs.*

Results of an epidemiological study on respiratory disease (chronic bronchitis, repeated acute bronchitis, obstructive syndrome, cough and minor bronchial syndromes), carried out on a random sample of 2000 females in Bordeaux, are presented. Minor respiratory troubles were found in 17.53%, chronic bronchitis in 12.33%, purely bronchitic syndromes in 7%, and serious dyspnea in 1.55%, bringing the percentage of females affected by any of the above syndromes to 29.86%. The frequency of the syndromes increased more or less regularly with age (14.6% in the 30-39, 21.% in the 40-49, and 32.4% in the 50-59 age bracket). Workwomen, particularly unskilled ones, were hardest hit by respiratory troubles. The frequencies of major syndromes and cough were higher for smokers (12.2% of the population), but the differences, marked in the age bracket of 30-49 years, abated in higher age brackets due to the compensating effect of age. The frequencies of both serious dyspnea and asthma were higher for females affected earlier by allergy or pleurisy. A comparison of the findings with a study on females employed in metallurgic and wood processing industries showed lower frequencies for the latter, while other studies revealed higher incidences in populations in England and the United States. Another comparison with a study on males in Bordeaux showed slightly higher percentages for males (chronic bronchitis in 11.75%). The differences, manifest mainly in major syndromes, were primarily due to smoking.

23740 APTIC NO. 42887

Davidson, Michael and Manning Feinleib

CARBON DISULFIDE POISONING: A REVIEW. *Am. Heart. J., 83(1):100- 114, Jan. 1972. 63 refs.*

Carbon disulfide poisoning with respect to its physical and chemical properties, historical background, sources of emissions, mechanisms of toxicity, and neurological, psychiatric, and physiological effects on human health is reviewed. The major sources of CS2 include rayon manufacturing, cold vulcanization of rubber, and the manufacture of rubber accelerators, resins, xanthates, thiocyanates, adhesives, pesticides, and tires. The rayon manufacturing process is outlined to emphasize the scope of CS2 emissions. Experimental data on neurological, cardiovascular, hepatic, renal, and hematologic changes are considered. The psychiatric aspects of CS2 toxicity include extreme irritability and uncontrollable anger, mood changes, memory defects, severe insomnia, and interference with sexual functions. In both acute and chronic intoxication, the symptoms of involvement of the nervous system are outstanding, including tremors, reflex diminution, headaches, nausea, and loss of vision. The particular effects of CS2 on the skin, eyes, ears, lung, liver, spleen, stomach and intestines, kidney, endocrine system, blood, and the heart and blood vessels are discussed.

23741 APTIC NO. 43264

Deleanu, Mauriciu C.

STUDIES ON ATMOSPHERIC IONIZATION AS AN ENVIRONMENTAL FACTOR AND ITS EFFECT ON THE ORGANISM. *(Untersuchungen ueber die Luft- ionisation als Umweltfaktor und ihre Wirkung auf den Organismus). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 8(10):776-781, Oct. 1962. 15 refs.*

Ionization in the air in closed rooms with varying degrees of ventilation, in industrial centers, and in health resorts was studied. Ionization represents a useful index for the intensity of air pollution. Predominance of negative ions contributes to a relaxing effect of the climate, whereas predominance of positive ions results in a stimulating effect of the atmosphere. Some allergic and anaphylactic conditions have shown improvements under the influence of air ionotherapy. About 40% of guinea pigs who had been given a lethal dose of antigen survived by being treated with ionized air. Rats with ulcers induced by starvation were subjected to an ionized air therapy, and were thereby greatly relieved from ulceration, contrary to untreated test animals. It may be assumed that atmospheric ionization acts upon various functions of the organism via the nervous system. The most favorable results were attained with test animals which received negatively ionized air. Promising results have also been attained in the application of air ionotherapy with human patients suffering from nervous disturbances, such as neurosis combined with sleeplessness.

23742 APTIC NO. 43173

Dorn, Harold F.

MORBIDITY AND MORTALITY FROM CANCER OF THE LUNG IN THE UNITED STATES. *Acta Unio Intern. Contra Cancer, vol. 9:552-561, 1953.*

Mortality from cancer in the United States has increased about 50% after adjusting for changes in the age distribution of the population, since the death registration area was organized in 1900. The death rate among white females reached a maximum between 1925 and 1930 and has since decreased about 4%. The rate for white males has continued to increase and is now higher than the rate for white females, with no clear cut indication that it is nearing a maximum. Mortality from cancer of several major groups of malignant neoplasms is now decreasing. Among these are cancers of the buccal cavity and pharynx, skin, digestive tract, and uterus. In addition, mortality from cancer of the breast shows no significant upward or downward trend. However, mortality from other major forms of cancer is still increasing; the greatest relative increase is for cancers of the respiratory system of which about 80% have their primary location in the bronchi and lungs. In both the white and nonwhite populations, the death rate from cancer of the lung and bronchus for males is about 4.4 times that for females. This differential is becoming greater due to the more rapid increase of the male mortality rate. From 1940 to 1950, the rate of increase in mortality from cancer of the lung and

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bronchus was only one half that of the previous decade. Among females death rates increased only at ages above 55 years; among males an increase was recorded at all ages above 35 years. Cancer morbidity data collected by the Naitonal Cancer Institute during 1937-39 and 1947-48 in 10 large metropolitan areas in the United States confirm these conclusions. Incidence rates for cancer of the lung and bronchus for Denmark, 1943-47, are similar to those obtained in the U. S. morbidity study of 1937-39. (Author summary modified)

23743 APTIC NO. 43617

Douglas, William J.

THE SILVER IODIDE GENERATOR AND PUBLIC HEALTH. *Preprint, American Society of Civil Engineers, New York, 16p., 1969. 14 refs. (Presented at the American Society of Civil Engineers Annual and Environmental Meeting, Chicago, Ill., Oct. 13-17, 1969, Paper 1060.)*

The possible deleterious effects of the materials released from a silver iodide generator used for cloud seeding and the question of a potential threat of air and water pollution are reviewed. For silver iodide and its complexes, iodine and carbon monoxide, maximum exposure was greatly below hazardous levels. The hazard from iodine vapor, silver iodide, or its complexes, to an individual in the immediate vicinity of a generator, or to the general population from air pollution by these materials, is nonexistant, therefore, under the normal operating conditions of a cloud seeding machine. Concentrations of silver and iodine in precipitation from seeded storms were also greatly below the permissible levels for drinking water. The chemical content of generator emissions was compared with that of automotive emissions to emphasize the inoffensive nature of the silver iodide generator.

23744 APTIC NO. 43692

Drouvin, Michel

OPERATION CARBON MONOXIDE IN THE BLOOD. *(Operation Oxycarbonemie). Text in French. In: Etudes de Pollution Atmospherique a Paris et les Departements Peripheriques en 1970. Prefecture de Police, Paris (France), Lab. Central, p. V-3 to V-17, April 1971.*

Results of blood carbon monoxide determinations, performed by two different methods in Paris are presented. The analysis of 446 blood samples was made by infrared spectrophotometric determination of CO in blood extract. The CO content was below 0.4 ml/100 ml in 189 cases, between 1.2 and 2.0 ml/100 ml in 19, and above 3.60 ml/ 100 ml in 7 cases, the maximum being 8.25 ml.100 ml. The blood CO was determined from the CO concentration in the alveolar air by means of the breath-holding method in 965 cases. Values below 0.4 ml/100 ml were determined for 326 non-smokers and 142 smokers, and between 1.2 and 1.60 ml/100 ml for 71 smokers. The CO concentrations in 57 smokers ranged from 2.0 to 3.60 ml/100 ml.

23745 APTIC NO. 43510

Einbrodt, H. J.

ASBESTOSIS AND PSEUDOASBESTOSIS BODIES (FERRUGINOUS BODIES). *(Asbestose- und Pseudoasbestosekoerperchen (ferruginous bodies)). Text in German. Pathol. Anat. Hals, Nasen, Ohren, Zahnheilkd. (Stuttgart), 41(4):504-506, 1970. 18 refs.*

Studies on asbestosis, pseudoasbestosis, and asbestos-like bodies are reviewed. Asbestosis bodies, containing a longitudinal asbestos fiber, pseudoasbestosis bodies without longitudinal orientation, and asbestos-like bodies of 20 micron or larger have a similar morphology and chemical structure in consisting of ferrous phosphate. Pleural mesothelioma due to filamentous asbestos, a highly carcinogenic substance, was observed. Pseudoasbestos bodies in the lungs of workers exposed to rutile, talc, and cork dust, and asbestos-like bodies in foundry workers were detected.0 The presence in the lung of ferruginous bodies was found to be associated with pulmonary fibrosis. Ferruginous bodies in 15% of populations not exposed to dust in industrial areas were detected, which suggests no relationship between such bodies and fibrotic and carcinogenic effects.

23746 APTIC NO. 42937

Elkins, Hervey B.

TOXIC FUMES--IN MASSACHUSETTS INDUSTRIES. *Ind. Med., 8(10):426- 432, Oct. 1939.*

While the dust diseases affect primarily the lungs, and dermatoses are by definition skin diseases, toxic gases and fumes may act selectively on any part of the body. For example, the lining of the nose is attacked by chromic acid, while the bladder, almost the last organ which contacts waste matter before it is eliminated, is the site of tumors caused by some amino compounds used chiefly in making dyes. Most industrial poisonings occur through the respiratory tract. Because contamination of the air is the chief source of poisoning, it follows that a first step in preventive effort is the development of apparatus and techniques for the measurement of the quantities of these various toxic materials in the atmosphere, and the formation of organizations capable of making such measurements. However, it is not enough to find out how much of a given fume is present in the air, but we must know approximately what effect, if any, the concentration found will have on the workers breathing the air. Toxicological studies on animals are mentioned. A table is presented which lists quantities proposed as threshold concentrations for a number of compounds, and some data are given on tests which have shown safe and unsafe concentrations.

23747 APTIC NO. 43615

Esch, G. J. Van and R. Kroes

THE INDUCTION OF RENAL TUMOURS BY FEEDING BASIC LEAD ACETATE TO MICE AND HAMSTERS. *Brit. J. Cancer (London), 23(4):765-771, 1969. 10 refs.*

Basic lead acetate was given to mice in a dose level of 0.1% and 1%/0.5% and to hamsters in a dose level of 0.1% and 0.5% in the diet. In the mice in the 0.1% group, seven renal tumors were found in 50 animals. In the 1.0%/0.5% group only one renal tumor was found. Most mice of the 1.0%/0.5% group and hamsters of the 0.5% group died early in the experiment, because of intoxication by the basic lead acetate. In hamsters no tumors of the kidneys could be found. Other specific alterations ascribable to the basic lead acetate were found in both animal species. In view of the fact that in rats and mice renal tumors were induced, it is suspected that basic lead acetate is also carcinogenic to hamsters. (Author summary modified)

23748 APTIC NO. 42419

Ferrara, Floreal A.

ECOLOGICAL ANALYSIS OF LUNG CANCER IN THE CITY OF LA PLATA. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 244-247. 4 refs. (Dec. 6-11, 1970, Paper MB 27F.)*

An analysis of the effect of smoking on lung, larynx, and bladder cancer patients in La Plata, Berisso, and Ensenada is presented. The daily consumption of cigarettes, duration of the smoking habit, and the age of both male and female patients are considered. The contribution of elements in the atmosphere such as viruses, bacteria, inert physical particles, and ionic and chemical particles (all designated as the urban factor) to respiratory diseases is noted. The results indicate the significance of the high association of lung, bladder, and larynx cancers with the smoking habit, and the importance of the urban factor in completing the pathogenic equation.

23749 APTIC NO. 43589

Flowers, Earl Shederick

AROMATIC HYDROXYLASE INHIBITORS AS ENVIRONMENTAL FACTORS IN THE PRODUCTION OF CANCERS. *California Univ., Berkeley, Dept. of Environmental Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1971, 107p. 97 refs.*

The mechanism of 3,4-benzopyrene hydroxylation by rat liver microsome preparations was investigated by enzyme inhibition experiments and by spectrophotometric measurements. Spectrophotometric evidence indicates that the heme prosthetic group of cytochrome c P-450 is the active site of the aromatic hydroxylase system. It is proposed from observed shifts and enhancements in the absorbance spectra on adding 3,4-benzopyrene to a cytochrome c P-450 preparation that the enzyme substrate complex is a heme-3,4-benzopyrene dioxygen bridge structure. The dioxygen bridge is thought to form between heme iron and a position of hydroxylation on the 3,4-benzopyrene ring system. The oxygen containing intermediate was stable, and it was possible to add the reduced form of nicotinamide adenine dinucleotide phosphate coenzyme and to follow reduction of the proposed complex. From the proposed enzyme substrate complex and the requirements for the reduced form of nicotinamide adenine dinucleotide phosphate, inhibitors considered to be important in increasing the risk of polyaromatic hydrocarbon carcinogenesis were chelates, electron transport uncoupling agents, and other substrates. Inhibition of aromatic hydroxylase activity is thought to be significant in terms of increasing the probability of adding carcinogenic polyaromatic hydrocarbons to deoxyribonucleic acid or other macromolecules such that there is an interference with the flow of genetic information. (Author abstract modified)

23750 APTIC NO. 42712

Franzen, E. and H. Thiede

STATISTICAL EVALUATION OF A METHOD FOR THE QUANTITATIVE DETERMINATION OF CARBOXYHEMOGLOBIN IN LOW CONCENTRATIONS. *(Statistische Bewertung einer Methode zur quantitativen Bestimmung des Kohlenoxydhaemoglobins bei geringen Konzentrationen). Text in German. Z. Ges. Hyg. ihre Grenzgebiete (Berlin), 10(1):44-51, Jan. 1964. 21 refs.*

Statististical investigation of two different methods for determining carboxyhemoglobin with regard to accuracy and applicability to routine tests in occupational hygiene was performed. A comparison of the standard deviations indicated the superiority of the Wennesland method, which is based on the reduction of palladium salts, and whose modified version is obligatory in occupational hygiene, to the recent Fretwurst Meinecke method. This method is based on spectrophotometric measurements of the extinctions of a diluted blood sample hemolyzed with 0.1% ammonia before and after the addition of sodium dithionite and sodium hydroxide at one defined wave length. This method, showing considerable deviations, particularly for low COHb concentrations, had increased reproducibility for high COHb levels, which suggests its applicability to cases of acute carbon monoxide intoxication. The COHb concentrations, as determined in non smoking chemical plant workers by means of the Wennesland and the Fretwurst-Meinecke methods, were 2.23 and 9.35, respectively.

23751 APTIC NO. 43472

Giddens, W. E., Jr. and G. A. Fairchild

HISTOPATHOLOGIC EFFECTS OF SULFUR DIOXIDE ON THE NASAL MUCOSA OF MICE FROM DEFINED-FLORA AND CONVENTIONAL COLONIES. *Preprint, Washington Univ., Seattle, Dept. of Pathology; Washington Univ., Seattle, Dept. of Experimental Animal Medicine; and Environmental Protection Agency, Research Triangle Park, N. C. Div. of Health Effects Research, 30p., 1972 (?). 21 refs.*

Disease-free mice from a defined-flora (DF) colony and conventional mice (CO) with mild upper respiratory disease were exposed to 10 ppm of sulfur dioxide for periods of up to 72 hrs to compare the histopathologic effects in the nasal cavity with those in the lungs within each group, and the differences in response to SO2 between DF and CO mice. The earliest lesions due to SO2 were observed in the nasomaxillary tubinates after 24 hours of exposure and consisted of edema, necrosis, and desquamation of the respiratory and olfactory epithelium. Lesions increased in extent and severity with duration of exposure up to 72 hrs. There was far more severe injury in the nasomaxillary turbinates than in the remainder of the respiratory tract. The CO mice with mild upper respiratory infection had more severe lesions than the DF mice. (Author abstract)

23752 APTIC NO. 42909

Goldstein, Elliot and Paul D. Hoeprich

INFLUENCE OF OZONE ON PULMONARY DEFENSE MECHANISMS OF SILICOTIC MICE. *Arch. Environ. Health, 24(6):444-448, June 1972. 17 refs.*

The effect of low concentrations of ozone (0.4-1.6 ppm) on mice with induced silicosis was investigated. Silicosis was induced by intratracheal injection of 10 mg silica; silicotic and latex injected controls were then infected with aerosols of Staphylococcus aureus labelled with phosphorus 32 and exposed for 4 hours either to ozone or air containing 21% oxygen. Murine pulmonary bactericidal activity rates were determined. An equivalently progressive decrease in pulmonary bactericidal activity occurred with exposure to increasing ozone concentrations for silicotic and control mice. Silicosis itself did not inhibit bactericidal activity, since the silicotic and control mice exposed to the oxygen had normal bactericidal activity. Anatomic abnormalities due to silicosis, therefore, do not enhance ozone induced inhibition in pulmonary bactericidal activity. (Author abstract modified)

23753 APTIC NO. 43277

Goldstein, Gerald

BIOCHEMICAL INDICATORS OF ENVIRONMENTAL POLLUTION. *Preprint Oak Ridge National Lab., Tenn., Analytical Biochemistry Group, 39p., 1972. 176 refs.*

Several studies related to the concept of biochemical indicators as monitors of environmental quality are reviewed. Several kinds of tissues and organs are potentially useful as indicators including plant tissues, various animal tissues, and blood. One study done with plant tissues showed that exposure to Peroxyacetyl nitrate, ozone, and fluorides inhibits the biosynthesis of cellulose due to the inactivation of phosphoglucomutase and cellulose synthetase. By studying various enzymes in fish, it is possible to determine the effects of pesticides and toxic metals. A dietary level of 5 ppm of DDT reduced the activity of glucose-6-phosphate dehydrogenase in rats. Guinea pigs were exposed to 15 ppm of nitrogen dioxide continuously for 10 weeks, and lung, liver, spleen, and kidney tissues subsequently examined. Lactic dehydrogenase and aldolase levels were elevated in most tissues. This indicates that chronic inhalation of air pollutants can cause alterations in tissue enzyme activity levels which can be detected and used as sensitive indicators. The measurement of cholinesterase activity in human blood plasma and erythrocytes can be used as an indicator of exposure to organophosphorus and carbamate pesticides. A decrease in the gamma-aminolevulinic acid dehydrase level may indicate exposure to lead. Nitrogen dioxide has been tested against mouse liver and rabbit and rat lung cell cultures. In the first case, increased cell mortality was observed and in the latter, a reduced oxygen consumption reflecting reduced cellular metabolism. Sulfur dioxide inhibits the growth of mouse liver cells and damages human lymphocytes in culture. Ozone inhibits the growth of human strain L cells. Peroxyacetyl nitrate inactivates isocitric dehydrogenase, glucose-6-phosphate dehydrogenase, and malic dehydrogenase within a few minutes. Ozone inactivates papain and glyceraldehyde-3-phosphate dehydrogenase. Atmospheric SO2 and 03 inactivate acetylcholinesterase.

23754 APTIC NO. 43238

Graf, F. A., Jr.

STORAGE, HANDLING, AND DISPOSAL OF TOXIC MATERIALS. *Preprint, American Inst. of Chemical Engineers, New York, 8p., 1971. 12 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 70th, Atlantic City, N. J., Aug. 29-Sept. 1, 1971.)*

The terms toxicity, LD-50, LC-50, and threshold limit value are defined. Seven sources of toxicological data are listed with brief annotations. Objectives and approximate costs of different toxicological testing programs are reviewed. Fourteen organizations that perform toxicological testing are listed. The interpretation of toxicity studies and the need for individual studies for compounds with apparently similar chemical characteristics are discussed. A six-degree classification system for toxicity levels is presented. Methods for handling, storing, and disposing of toxic materials are recommended.

23755 APTIC NO. 42396

Groll-Knapp, Elisabeth, Hannelore Wagner, Helger Hauck, and Manfred Haider

THE ACTION OF LOW CARBON MONOXIDE CONCENTRATIONS ON THE ALERTNESS AND COMPUTER-ANALYZED BRAIN POTENTIAL. *(Auswirkung geringer Kohlenmonoxid-Konzentrationen auf Vigilanz und computeranalysierte Hirnpotentiale). Text in German. Staub, Reinhaltung Luft, 32(4): 186-188, April 1972. 33 refs. (Presented at the VDI (Verein Deutscher Ingenieure) Clean Air Maintenance Committee, Carbon Monoxide Symposium, Duesseldorf, West Germany, Oct. 28-29, 1971.)*

The effects of different carbon monoxide concentrations (50, 100, and 150 ppm) on human brain function were studied in an acoustic vigilance test with simultaneous lead-off of slow (4-second) brain potentials (expectancy waves) analyzed by computer. The test persons were exposed to a total of 200 critical acoustic signal pairs spaced at 1.1-second intervals over 1.5 hours. The number of responseless critical sound pairs (35 for 50 ppm, 40 for 100 ppm, and 44 for 150 ppm) increased with the CO concentration. The impairment in the performance was particularly high during the second half of the test period, and was accelerated by the CO effect. The expectency waves (potential buildup after the first and drop after the second acoustic signals) varied with the CO concentrations. Linear relationship between the amplitude and the CO concentration was determined. The results indicate statistically significant impairment of the vigilance due to the inhalation of CO even in a concentration of 50 ppm.

23756 APTIC NO. 42704

Gross, Paul and Robert T. P. deTreville

INORGANIC FIBERS IN THE LUNGS OF URBANITES: ARE THEY A HEALTH HAZARD? Preprint, American Industrial Hygiene Assoc., Detroit, Mich., 12p., 1971. 18 refs. (Presented at the American Industrial Hygiene Association, Annual Convention, Toronto, Ontario, May 24-28, 1971.)

The discovery of ferruginous bodies in the lungs of urbanites raised the specter of epidemic asbestosis. However, the usefulness of so-called asbestos bodies as indicators of asbestos fibers became undertain when the former were shown to be nonspecific. Attention then shifted to the inhaled fibers themselves. Millions of optically visible, plus several times as many submicronic inorganic fibers were estimated to be in city dwellers lungs. Some of these fibers and fibrils were identified as chrysotile, but a fibrogenic role of asbestos fibers less than 5 micron long is questionable. Although the percentage of asbestos among the accumulated inorganic fibers in lungs is not known, there is no evidence that pulmonary fibrosis suggestive of asbestosis has resulted. However, there is a need for more thorough histopathologic studies of lungs of city dwellers with correlative determinations of their asbestos content. (Author abstract modified)

23757 APTIC NO. 42699

Grushko, Ya. M.

OCCUPATIONAL POISONING AND DISEASES CAUSED BY CHROMIUM. REVIEW OF THE LITERATURE. *(O professional nykh ortavleniyakh i zabolevaniyakh pod vliyaniyem khroma. Obzor literatury). Sov. Med., vol. 27:125-130, 1963. 41 refs. Translated from Russian. Translation Consultants Inc., Arlington, Va., 15p.*

The literature on occupational diseases caused by chromium is reviewed. The upper respiratory passages, particularly the nasal mucous membranes, are frequently damaged when chromium is present in the air of working areas. Chromium can also exert an influence on the deeper parts of the respiratory passages, causing such diseases as pneumonia, acute and chronic bronchitis, and asthmatic bronchitis. There are indications of a possibility of the development of lung cancer in individuals exposed to chromium compounds. According to published data, in most cases workers at chromium plants have bronchial cancer, whereas insoluble chromium compounds are found in the lungs, tracheo bronchial glands, and nasal septum. Skin damage, such as dermatitis and chronic eczema, pathologic changes in the kidneys, and toxic effects on the digestive organs and heart are frequently observed. Measures for preventing these occupational diseases include isolation, mechanization and automation of production processes, individual precautions, therapeutic diet, and periodic examination of workers.

23758 APTIC NO. 42884

Haeger-Aronsen, Birgitta, Mohammed Abdulla, and Bengt I. Fristedt

EFFECT OF LEAD ON DELTA-AMINOLEVULINIC ACID DEHYDRASE ACTIVITY IN RED BLOOD CELLS. *Arch. Environ. Health, vol. 23:440-445, Dec. 1971. 34 refs.*

The determination of delta-aminolevulinic acid dehydrase (ALAD) activity in erythrocytes as a suitable method for demographic studies of exposure to lead is examined. The variation of ALAD activity with the concentration of delta-aminolevulinic acid in the urine and the variation of ALAD activity with the concentration of lead in the blood were both exponential and the correlations inverse. Values were determined for hemoglobin level, lead concentration in the blood, aminolevulinic acid level in the urine, and ALAD activity in red blood cells in children, a control group of normal men and women, traffic personnel, and men with moderate or severe exposure to lead. ALAD activity in red blood cells varied significantly with sex. No significant difference was found in blood lead level or acid content in the urine between traffic personnel and normal men; the activity of ALAD in erythrocytes, however, was higher in the traffic personnel. The activity of ALAD in erythrocytes, however, was higher in the traffic personnel. The activity of ALAD in erythrocytes accurately reflects the blood lead level; the test is too sensitive, however, for routine followup of the degree of lead intoxication in occupationally exposed workers.

23759 APTIC NO. 43295

Halperin, M. H., R. A. McFarland, J. I. Niven, and F. J. Roughton

THE TIME COURSE OF THE EFFECTS OF CARBON MONOXIDE ON VISUAL THRESHOLDS. *J. Physiol. (London), no. 146:583-593, 1959. 9 refs.*

Results of studies of effects on visual discrimination of the anoxia produced by mild degrees of carbon monoxide poisoning and by hypoxic anoxia caused by breathing gas mixtures containing subnormal partial pressures of oxygen are presented. Results of tests indicate that recovery from detrimental effects of carbon monoxide on visual sensitivity lags behind the elimination of carbon monoxide from the blood, the effect apparently being determined by the duration of the presence of carbon monoxide in the blood as well as its concentration. Administration of 100% oxygen results in an immediate improvement which disappears when ordinary air is again breathed. This suggests the possible existance in the central nervous and/or peripheral visual system of some enzyme or other visually important constituent which combines competitively with carbon monoxide and oxygen. Carbogen not only causes more rapid elimination of carbon monoxide from the body, but seems to have a somewhat more beneficial countering effect against carbon monoxide than does oxygen. (Author summary modified)

23760 APTIC NO. 42450

Hammer, Douglas I., John F. Finklea, John P. Creason, Samuel H. Sandifer, Julian E. Keil, Lamar E. Priester, and Jerry F. Stara

CADMIUM EXPOSURE AND HUMAN HEALTH EFFECTS. *Preprint, Missouri Univ., Columbia, 28p., 1971. 59 refs. (Presented at the Conference on Trace Substances in Environmental Health, Annual, 5th, Columbia, Mo., June 29-July 1, 1971.)*

Cadmium is highly toxic to man. Direct industrial exposures have produced acute and chronic poisoning in workers. Secondary environmental exposure has also been suggested as a cause of chronic poisoning. Cadmium has been suggested as a cause of hypertension and cardiovascular disease. Hemoglobin, hematocrit, plasma, urinary cadmium and zinc, blood pressure, and cholesterol were studied in workers exposed to cadmium dust. High, intermediate, and low exposure was designated by job location. Hemoglobin and hematocrit were unrelated to exposure. Cadmium and zinc in plasma, but not urine, were elevated in the intermediate and high exposure groups. Systolic and diastolic blood pressures increased with age, but inconsistently followed the exposure gradient. Cholesterol levels showed a relationship to age, but were not consistently related to exposure. This study related cadmium exposure to early and sensitive physiologic desease precursors rather than to overt disease or death. Thus, lack of any consistent relationship between exposure and these indicators is noteworthy. Previous evidence linking cadmium to human hypertension and cardiovascular disease is tenous and not very convincing.

23761 APTIC NO. 42395

Hansen, Ove, Harald Wilke, Guenter Malorny, and Manfred Goethert

ABSORPTION AND RELEASE OF CARBON MONOXIDE IN SMOKERS AND NONSMOKERS DURING THE INHALATION OF LOW CO CONCENTRATIONS. *(Aufnahme und Abgabe von Kohlenoxid waehrend Einatmung niedriger CO-Konzentrationen bei Rauchern und Nichtrauchern). Text in German. Staub, Reinhaltung Luft, 32(4):167-169, April 1972. 9 refs. (Presented at the VDI (Verein Deutscher Ingenieure) Clean Air Maintenance Committee, Carbon Monoxide Symposium, Duesseldorf, West Germany, Oct. 28 and 29, 1971.)*

Differences in the carbon monoxide absorption and release by smokers and nonsmokers was tested. The persons tested (21 females, 57 males, aged 19-40 years) were exposed to concentrations of 50 or 200 ppm over 3.5 hours. Equilibrium between alveolar CO content and blood carboxyhemoglobin content was observed. Rapid CO saturation at the start of the test followed by sharp decrease in the absorption was determined. Since the alveolar air CO concentration did not reach the CO concentration in the inhaled air, no complete saturation to diffusion equilibrium was reached. The absorption curves obtained for nonsmokers and smokers (the alveolar air CO concentration in the latter was 24 ppm prior to the test) were different even at the end of the 3.5 hour test. Extended tests showed that the equilibrium conditions were reached at largely the same time by smokers and nonsmokers alike exposed to 200 ppm, while tests with 50 ppm revealed smokers to reach equilibrium conditions considerably earlier than nonsmokers. Carbon monoxide release tests (2.5 hours) furnished different curves for smokers and nonsmokers, indicating higher CO concentrations in the exhaled air for smokers than for nonsmokers at the end of the test. The higher the volume of CO absorbed prior to the tests (with tobacco smoke, for example), the lower the volume absorbed during the test. A certain CO saturation in the organism, necessary for the toxic effect to appear, is more readily reached in smokers than in nonsmokers.

23762 APTIC NO. 43161

Herczeg, Tibor

THERMOMECHANICAL AEROSOL AS AN INSECT CONTROL TECHNIQUE HARMLESS TO HUMAN ENVIRONMENT. *(A termomechanikus aerosol mint az ember kornyezetet nem szenneyzo eljaras az egeszsegre karos rovarok elleni vedekezesben). Text in Hungarian. Budapesti Kozegeszsegugy, 1(4):113-115, 1968.*

The action mechanism of insecticide sprays applied by the harmless thermomechanical technique, as well as related experiments, is described. Thermomechanical aerosols, generated in the form of fine liquid droplets of 1-15 micron diameter, cannot precipitate under certain conditions but still have a strong rapid lethal effect due to their large specific surface. The aerosols should be generated at the largest possible distance (200-400 m) from the aerosol generator. The decrease in the initial steam content at such distances is slow. Tests carried out on flies and mosquitos with known aerosol doses showed that a fraction of the LD50 dose is sufficient for the lethal effect because the action mechanism of thermomechanical aerosols differs from that of conventional application techniques. The aerosol envelops insects and readily penetrates to the respiratory tract and the lymph, thus paralyzing the ganglions of the central nervous system. The action is so rapid that no mechanical resistance can develop, nor is there time for the defense mechanism to act. The efficiency is practically independent of meteorological conditions. Because the fine droplets are unable to deposit at body temperature, and are eliminated by the lungs, the pesticide is harmless to man and warm- blooded animals, as proved by tests performed on white rats. The selectivity, independent of that of the active substance, is due to the great differences in the respiratory area, the specific oxygen demand, and the defense mechanism of insects and warm-blooded animals.

23763 APTIC NO. 43459

Hermann, Joseph

STUDIES ON DISEASE FORMS IN IDRIA. *(Studien ueber Krankheitsformen in Idria). Wien. Med. Wochschr., 8(40):697-700, Oct. 2, 1858; Ibid., 8(41):713,717, Oct. 9, 1858; Ibid., 8(42):732-735, Oct. 16, 1858; and Ibid., 8(43):750-751, Oct. 23, 1858. Translated from German. 27p.*

Symptoms attributed to mercury poisoning (mercurial cachexia, dyspepsia, pytyalism, scrophula, anemia, neuralgias, mercurial gout, mercurial tremors, and caries) were found in 122 of 516 mercury miners and workers at metallurgical and cinnabar plants in the Idria Valley at Krain during the year of 1857. Examination of workers and townspeople showed the following disorders prevalent amongst the examinees: pharyngitis, with severe inflammation of parts of the gums and throat and slackness and swelling of the mucosa; scrophula; dyspepsia; changes in liver function, especially intumescence and congestion; neuralgias, such as gastralgia, ischialgia, and facial pain; and, osteopathies, particularly periosteitis, osteitis, exostosis, necrosis, and caries. The most effective, fastest, and most successful methods of treatment prescribed were long periods of increased sweating and the inhalation of clean air or potassium iodide. Mercury is the only etiological factor which could account for the above symptoms, and these symptoms are not related to syphillis.

23764 **APTIC NO. 42661**

Honma, Shuji

A SIMPLIFIED METHOD FOR DETERMINATION OF LEAD IN THE BLOOD AND URINE BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. *(Genshi kyuko bunsekiho ni yoru nyo chu oyobi ketchu no namari sokutei ho). Text in Japanese. Igaku to Seibutsugaku, 84(6):329-333, June 10, 1972. 6 refs.*

The Pye-Unicam SP 90 type absorption spectrophotometric (made in Great Britain) combined with the Riken SPG-4 type recorder was used to determine lead in blood and urine. Using the standard lead liquid of 50 ng/dl reduced to APDC complex as the extraction solvent and lamp current set at 10 mA, sensitivity increased linearly with the slit width set at 0.1-0.2 mm but noise also increased, making the value reading impractical. The standard setting of the slit width was set at 0.2 mm. The effect of the addition of formamide on promoting ionization of organics was examined. Addition of formamide resulted in increased absorbancy, but the increase remained about the same with a 2-10 ml addition, so 2 ml was used. When 2 ml of 2% water solution of the chelate agent was used, APDC-MIBK gave the most stable chelate formation in a wider pH range. The extraction was made in the condition that pH of the test sample was on the acidic side. Recovery rate for lead in the blood was 97% and in the urine, 101.2%. The normal deviation factor was 2.76 for the blood and 3.78 for the urine. The effect of coexisting elements was reviewed; their effects should be negligible under normal conditions. Reproducibility was 99.4% w/normal deviation of 1.51.

23765 **APTIC NO. 43324**

Horiguchi, Hiroshi

POLLUTION AND TOXIC AND HAZARDOUS SUBSTANCES. ORGANIC. *(Kogai to doku kikenbutsu. Yukihen). Text in Japanese. Tokyo, Sankyo Shuppan, 1971, 540p. 411 refs.*

Pollution, toxic and hazardous substances, and organic compounds are described in the following classifications: hydrocarbons, halogenated hydrocarbons, alcohols and hydrogenated alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, nitro compounds, nitroso compounds, diazo compounds, azo compounds, cyanides and nitriles, cyanic acid and isocyanic acid, urea and guanidine, carbamic acids, sulfonic acids and sulfinic acids, sulfones and sulfoxides, mercaptans, thioethers, thiourea, thiocyanic acid and isothiocyanic acid, xanthogenic acid, thiocarbamic acids and dithiocarbamic acids, pyrroles and pyrrolines, pyrazoles, imidazoles, triazoles and tetrazoles, pyridines, quinolines and acridines, diazines and triazines, oxazoles and oxazines, thiazoles, thiazines and phenothiazines, alkaloids, glucosides, and antibiotics. Major substances are listed with the structures, melting points and/or boiling points, specific gravities, and toxic properties.

23766 **APTIC NO. 43323**

Horita, Hiroshi

POLLUTION AND TOXIC AND HAZARDOUS SUBSTANCES. GENERAL THEORY. *(Kogai to doku kikenbutsu soronhen). Text in Japanese. Tokyo, Sankyo Shuppan, 1971, 240p. 76 refs.*

Pollution, toxic and hazardous substances are discussed. Poisons are discussed, including acute and chronic poisoning, the effects in bodies, and the chemical structure. Air pollution problems are described in terms of sulfur dioxide, carbon monoxide, chlorine and chlorides, bromine, fluorine and fluorides, hydrogen sulfide, nitrogen oxides, ozone, hydrocarbons, particulates, soots, and radioactive substances. Soil pollution, river pollution, sea pollution, fires, and explosions are mentioned. Tables of plant damage by air pollution, threshold values of various polluters in drinking water, and a list of poisonous, combustible, and explosive compounds are included.

23767 **APTIC NO. 43380**

Horvath, Steven M., Thomas E. Dahms, and James F. OHanlon

CARBON MONOXIDE AND HUMAN VIGILANCE. A DELETERIOUS EFFECT OF PRESENT URBAN CONCENTRATIONS. *Arch. Environ. Health, vol. 23:343- 347, Nov. 1971. 16 refs.*

An investigation was conducted to determine whether carbon monoxide gas is a factor responsible for deterioration of vigilance in men breathing polluted air. Ten subjects were exposed for slightly longer than two hours, on separate occasions, to CO levels approximating the average (26 ppm) and peak (111 ppm) levels found while driving in urban traffic. During the last hour of each exposure the subjects undertook a standard test of visual vigilance. They also undertook the test while breathing air without CO. Blood carboxyhemoglobin levels were measured prior to exposure, before and after the tests. Heart rates and minute ventilatory volumes were also measured. Vigilance was impaired by breathing 111 ppm CO, which raised the average COHb level to 6.6%. Heart rates and minute ventilatory volumes were not affected. (Author abstract modified)

23768 **APTIC NO. 42349**

Hueper, W. C.

PUBLIC HEALTH HAZARDS FROM ENVIRONMENTAL CHEMICAL CARCINOGENS, MUTAGENS AND TERATOGENS. *Health Phys., 21(5):689-707, Nov. 1971. 101 refs. (Presented at the Health Physics Society, Annual Meeting, Chicago, Ill., July 1970.)*

Environmental chemical and radiation cancer hazards form the principal segments of the human environmental spectrum of carcinogenic risks. The cancer hazards from both types of carcinogenic agents have been rising during the past 75 years because of the growing contamination of the environment with industrial products and wastes. This development is responsible for the increases in frequency of certain cancers in many industrialized countries and for the shifts in age and sex distribution of certain cancers in general or circumscribed population groups. Since carcinogenic effects on cells are largely irreversible, and thus persistent and cumulative when repeated, exposure to even small doses of carcinogens, sustained over long periods in a carcinogenically polluted environment, create definite cancer risks. A reliable method or procedure does not exist for determining and defining a safe dose. All avoidable environmental carcinogens, therefore, should be eliminated and prevented from entering the environment. All unavoidable carcinogenic risks should be reduced to the lowest possible minimum and the exposed individuals should be kept under life-long medical surveillance for the detection of precancerous and early cancerous lesions which might result from such contacts. Since similarities exist between the biologic characteristics of chemical carcinogens, mutagens, and teratogens with those displayed by carcinogenic radiations, the principles and criteria found useful and valid in the identification and control of chemical cancer risks are also applicable for the preventive management of radiation cancer hazards. (Author abstract modified)

23769 **APTIC NO. 43423**

Ikui, Hiroshi, Kenji Sugi, and Shigekazu Uga

OCULAR SYMPTOMS IN OIL DISEASE PATIENTS AND ELECTRON MICROSCOPE HISTOLOGICAL FINDINGS IN OIL DISEASE PATIENT S CONJUNCTIVA. *(Yusho kanja no ganshojo oyobi yusho kanja ketsumaku no denshi kenbikyo sosikigakutekk shoken). Fukuoka Igaki Zasshi (Fukuoka Acta Med.), 60(6):432-439, 1969. 5 refs. Translated from Japanese. Translation Consultants Inc., Arlington, Va., 14p.*

The ocular symptoms of 218 patients with chronic chlorobiphenyls poisoning are described. The main symptoms are hypersecretion of the meibomian gland and abnormal pigmentation of the conjunctiva. In the typical cases, a cystic swelling of the meibomian gland filled with yellow infarct-like contents was observed. The lid margin, where the gland acini open, becomes irregular. The abnormal pigmentation of the conjunctiva is believed to be caused by melanin deposited in the tissue. The pigmentation is noticed especially in the palpebral conjunctiva of the lower lid, the lower nasal half of the palpebral conjunctiva of the upper the lower fornix and the limbal conjunctiva. Transient visual disturbance is caused by the oily precorneal film due to the hypersecretion of the meibomian gland. No particular lesion is observed in the intraocular tissues. Pieces of pigmented bulbar and fornix conjunctivas were excised from two patients and examined under the electron microscope. A large number of melanin granules were seen in the cytoplasm of the epithelial cells, especially in that of basal cells of the conjunctiva. Many tiny electron-dense particles with diameters of 300-400 angstroms were distributed diffusely in the cytoplasm of the basal cells. The nature of these particles is unknown.

23770 APTIC NO. 42757

Kehoe, Robert A., Frederick Thamann, and Jacob Cholak

ON THE NORMAL ABSORPTION AND EXCRETION OF LEAD. I. LEAD ABSORPTION AND EXCRETION IN PRIMATIVE LIFE. *J. Ind. Hyg., 15(5):257-272, Sept. 1933. 22 refs.*

Two isolated Mexican communities were studied in an attempt to measure the physological activity of lead in societies not influenced by the industrialized world. Urine and feces were taken from 95 subjects and analyzed for lead content. Lead content in feces was equivalent to the amounts of lead ingested daily. The presence of lead in human excreta is an inevitable consequence of life on a lead bearing planet. A basis has been provided for the appraisal of results obtained in a highly industrialized society. Lead in soil, water, pottery, food, blood, urine, and feces was measured.

23771 APTIC NO. 43520

Kharlamova, S. F.

PROTEIN FRACTIONS OF BLOOD SERUM IN EXPERIMENTAL BERYLLIUM INTOXICATION. *(Belkovye fraktsii syvorotki krovi pri eksperimental noy intoksikatsii berilliem). Gigiena Truda i Prof. Zabolevaniya, 12(11):58-59, 1968. 9 refs. Translated form Russian. 5p.*

The globulin fraction content change in the blood was studied during beryllium intoxication. In the first series of tests, white male rats weighing 100-250 g were given intramuscular injections of 0.5 ml 0.2 M aqueous beryllium sulfate. Animals were sacrificed at 2 wk, 1, 2, 3, and 5 mon after the start of the test. In the second series, rats were given intratracheal injection of 10 mg beryllium oxide in a 0.5 ml physiologic solution. Animals were studied in 2 wk, 1, 2, and 6 mon after dusting. Changes in the amount of protein fractions in Series Two rats occur later than when soluble compounds are injected. After a month, in the animals of both series, the greatest disturbances are observed in relation to the protein fractions of blood serum. Shifts in the protein formula of blood serum in both series of tests are due to changes in the amount of albumins and alpha and beta globulin fractions, which are formed primarily in the liver. At later dates, (5-6 mo) the most pronounced disturbances of protein fractions are seen only in the series of tests with beryllium sulfate and appear as gamma-globulinemia, whereas in the series of tests with beryllium oxide, changes in the gamma globulin content at later dates are unreliable.

23772 APTIC NO. 43525

Kharlamova, S. F. and I. N. Potapova

BERYLLIUM CONTENT AND ITS CELL FRACTIONS DETERMINED EXPERIMENTALLY. *(Soderzhaniye berilliya v pecheni i yeye kletochnykh fraktsiyakh, ustanovlennoye v eksperimente). Farmakol. i Toksikol. (Moscow), vol 31:357-360, 1968. 3 refs. Translated from Russian. 6p.*

Beryllium oxide was administered intratracheally at the rate of 3.6 mg Be per rat. Beryllium sulfate was given intramuscularly at the rate of 0.9 mg per rat. The animals were studied 2 wk 1, 2, 3, and 5-6 mo after the administration. When soluble salts of Be are administered (BeS04-4H20), 0.07-0.61 microgram Be/g tissue is retained in the liver for 2 wk to 5 mo. The Be is detected in all cell fractions, with the predominant content in the nuclei. When insoluble compounds of Be are administered (BeO), 0.01-0.05 microgram Be/g tissue is detected in the liver for periods of investigation from 1 to 6 mos the Be was contained mainly in the nuclei. Even slight amounts of Be in the liver caused distinct disruptions of organ structure, manifested in changes in the nucleus configuration, disorganization of the endoplasmic network, increased count of lyzosomes and fatty inclusions, and breakdown of mitochondrial structure.

23773 APTIC NO. 43651

Kim, Sung Jo, Jae Bok Lee, Woo Suck Lee, and Pock Tuck Chung

CHANGES IN THE RED CELL VOLUME AND THE PLASMA CHLORIDE LEVEL UNDER THE HIGH CO2 CONCENTRATION IN VITRO. *(Koh-nong-do-e CO2-ga juk- hyul-goo-yong-jung mjt hyal-jung chloride-chjh-e myh-chi-nun yung- hijang). Text in Korean. Dae-han Saeng-rih-hak-whae-jih (Korean J. Physiol., 4(1):13-17, 1970. 18 refs.*

Changes in red cell volume and plasma chloride level under high carbon dioxide concentration in vitro were investigated. The changes were measured when the blood CO2 content was altered by equilibration with atmospheric air or pure CO2 for 20 min. The red cell volume was expressed in terms of hematocrit and mean corpuscular volume (MCV). The results indicated that an increase of the blood CO2 content under the experimental condition causes a decrease in the plasma chloride level and an increase in the red cell volume; conversely, a decrease of the blood CO2 content causes an increase in the plasma chloride level and a decrease in the red cell volume. A parallel relationship exists between the extent of the decrease in the plasma chloride level and that of the increase in the red cell volume.

23774 APTIC NO. 43592

Kuratsune, Masanori, Takesumi Yoshimura, Junichi Matsuzaka, and Atsuko Yamaguchi

YUSHO, A POISONING CAUSED BY RICE OIL CONTAMINATED WITH POLYCHLORINATED BIPHENYLS. *HSMHA (Health Serv. Ment. Health Adm.) Health Rep., 86(12):1083-1091, Dec. 1971. 13 refs.*

A peculiar skin disease, Yusho, was observed in residents of Fukuoka-Ken, Japan, in October 1968, which later spread over the western part of the country. The symptoms included dark brown pigmentation of nails, distinctive hair follicles, increased sweating at palms, acne-like skin eruptions, pigmentation of skin, increased eye discharge, and swelling of upper lids. By the use of basic epidemiologic methods, the cause of the disease was shown to be a specific brand of rice oil that had become contaminated with a heat transfer agent during processing. This agent, Kanechlor, is a complex mixture of polychlorinated biphenyls. Women who consumed the contaminated oil delivered babies or fetuses with peculiar dark-brown stained skin, nails, and gingiva. Many patients with Yusho are still suffering the effects of the disease. It has been reported that environmental pollution with polychlorinated biphenyls is growing in many countries.

23775 APTIC NO. 42993

Lave, Lester B. and Eugene P. Seskin

DOES AIR POLLUTION CAUSE ILL HEALTH? Carnegie-Mellon Univ., Pittsburgh, Pa., School of Industrial Administration, Air Pollution Control Office Fellowship AP48992-02, 24p., Aug. 1971. 16 refs.

Studies were conducted to estimate the relationship between air pollution and mortality, using mortality rates in 117 standard Metropolitan Statistical Areas (SMSAs). Variations among the SMSAs are explained in terms of physiologic characteristics such as age, sex, and race distribution; socioeconomic characteristics such as income distribution and occupation mix; environmental factors, including air pollution levels, radiation levels, climatologic characteristics, and domestic factors; and personal factors such as smoking habits, medical care, exercise habits, nutritional history, and occupation. The variables used in the analysis are shown in tabular form. Results indicate that the relationship between pollution and mortality is not spurious. Air pollution is a significant factor in explaining mortality rates for the very young, very old, and people with cardiovascular and respiratory diseases. It is an insignificant and inconsistent factor in explaining mortality rates for young adults and people dying from suicide. The implication of the basic result for total mortality is that a 50% decrease in the relative air pollution is estimated to lower the mortality rate by 4.5%. It is assumed that abating air pollution by 50% would also reduce morbidity rates by 4.5%. A substantial pollution abatement program should be established immediately.

23776 APTIC NO. 42352

Lawther, P. J. and J. A. Bonnell

SOME RECENT TRENDS IN POLLUTION AND HEALTH IN LONDON--AND SOME CURRENT THOUGHTS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 213-216. 13 refs. (Dec. 6-11, Paper MB 21D.)*

Daily changes in mortality and morbidity in London have been studied carefully since the 1952 episode when, during and soon after the period of high pollution, the deaths in Greater London were about 4000 more than expected. Since the winter of 1962-1963 when two episodes of special significance occurred, the association between pollution and mortality and morbidity has been barely perceptible, and the curves for 1967-1968 showed hardly more than random variation. Pollution by coal smoke has declined dramatically in many towns in Britain as a result of the establishment of Smoke Control Areas, redevelopment of towns, and voluntary change from the burning of coal on open grates to the use of cleaner forms of heating. There has been some diminution in pollution by sulfur dioxide and it is noteworthy that there has been a dramatic reduction in the number of days when the concentration of the gas exceeded 500 micrograms/cu m. This rather unexpected finding may be explained by the fact that the absence of a pall of smoke enables the sun to break up temperature inversions. These studies of mortality and morbidity are relatively crude in that the background variations due to disease which one would hesitate to attribute to air pollution dilutes the effect one is seeking to display. Various problems in interpreting these epidemiological surveys are considered.

23777 APTIC NO. 43350

Lebowitz, Michael D., Eric J. Cassell, and James D. McCarroll

HEALTH AND THE URBAN ENVIRONMENT. XV. ACUTE RESPIRATORY EPISODES AS REACTIONS BY SENSITIVE INDIVIDUALS TO AIR POLLUTION AND WEATHER. *Environ. Res., 5(2):135-141, June 1972. 4 refs. (Presented at the Society for Epidemiologic Research, Annual Meeting, 1969.)*

To delineate individual health responses to environmental conditions, both weather and air pollution, in a healthy urban panel, individuals sensitive to environmental extremes were sought and examined. A sensitive individual was one who reacted consistently to these extremes, the reaction taking the form of an acute illness. Upper respiratory illnesses, and common colds specifically, were of major interest. Of the 1173 individuals examined, who accounted for 4103 acute respiratory illnesses, 132 were considered sensitive by the definition. These individuals had 895 illnesses. In comparison with the nonsensitive group, the illnesses in the sensitive group occurred more frequently in winter (when pollution episodes were also more frequent) and were both longer and more severe.

23778 APTIC NO. 43464

Love, G. J., C. M. Shy, D. C. Calafiore, F. B. Benson, and J. F. Finlea

THE STRATEGY FOR DETERMINING THE EFFECTS OF ENVIRONMENTAL POLLUTION ON HUMAN HEALTH. *Preprint, 8p., 1971 (?).*

Field studies of the health effects of air pollution, under the auspices of the Environmental Protection Agency, are being undertaken in sets of cities across the United States. The primary pollutants and the individual sites investigated include particulate and sulfur dioxide gradients in New York City (seven communities); SO2 gradients in Utah (four communities); particulate gradients in the South Eastern Trio (six communities); nitric oxide-nitrogen dioxide gradients in Chattanooga (three communities); photochemical oxidant gradients in South California (seven communities); and metal-SO2 gradients in Montana and Idaho (five communities). The focal point for health information in the various communities is the local school, where questionnaires are sent to each home through the children. After the completed questionnaires are received, each family is contacted in person or by telephone and their cooperation is solicited. The cooperation may be the registering of the entire family in a prospective study of respiratory illness, or of individual family members who may be included on panels of asthmatics or elderly persons with chronic respiratory or cardiac illness. The health indicators for which data are collected include those believed to be associated with chronic or acute exposure to pollutants.

23779 APTIC NO. 42766

Lynch, Sean R. and Austin L. Moede

VARIATION IN THE RATE OF ENDOGENOUS CARBON MONOXIDE PRODUCTION IN NORMAL HUMAN BEINGS. *J. Lab. and Clin. Med., 79(1):85-95, Jan. 1972. 23 refs.*

The rate of endogenous carbon monoxide production was measured in seven men and nine women, using a rebreathing technique. Between two and five measurements were made in each of 15 of the normal volunteers at intervals of between 12 hours and 7 weeks. Significant variations occurred in the estimation in both men and women. In women, measurements made during the premenstrual half of the menstrual cycle were significantly higher than those made during the postmenstrual half. A significant correlation was observed between the fluctuations which occurred in each individual in the rate of endogenous CO production, the serum iron level, and the serum unconjugated bilirubin concentration. Significant variations occur in the rate of heme catabolism in normal beings, and these are reflected in the fluctuations seen in the rate of endogenous CO production, the serum iron level, and the serum unconjugated bilirubin concentrations. (Author abstract modified)

23780 APTIC NO. 43668

Lyubetskiy, Kh. Z., D. G. Krasil shchikov, and T. Ye Reshetova

GRANOSAN FOOD POISONING CASES. *(K voprosu o pishchevykh otravleniyakh granozanom). Gigiena i Sanit., 26(3):68-71, March 1961. 6 refs. Translated from Russian. Leo Kanner Assoc., Redwood, Calif., 8p., April 1972.*

Four cases of family intoxication caused by eating bread products made from flour containing granosan are discussed. Granosan is a mixture of ethylmercuric chloride and talc. Due to its high fungicidal and bacterial properties, granosan has gained very wide acceptance as a seed dressing agent used to control rust, fusariosis, and other causative agents of plant diseases. It can be used in seed dressing of cereal, legume, industrial, and vegetable crops. Granosan is highly toxic to man and animals when ingested with food or inhaled. The four case histories discussed have several features that are typical of granosan food poisoning. The first signs of poisoning appeared only 5 to 26 days following the consumption of the bread containing granosan. Small children became ill first, followed by older children, and adults last. Intoxication usually involved groups or families and affected only those who had eaten bread. The first symptoms were complaints of poor health, appetite loss, emaciation, and constant severe thirst. Later symptoms included damage to the internal organs, such as ulcerous stomatitis, disorders of the digestive organs, paralysis and, in some cases, death. Granosan food poisoning is characterized by a high mortality rate. The underlying mechanism of the food poisoning is the mercury blockage of thiol enzymes, resulting in a disruption of intermediary metabolism. The most effective means of treating granosan victims is with unithiol and dicaptolquinione preparations.

23781 APTIC NO. 43664

Maeda, Satoshi

AN EXPERIMENTAL STUDY OF THE ACTION OF BERYLLIUM IN BIOLOGICAL ORGANISMS. *(Beryllium no seitainai sayo kijo ni kansuru jikkenteki kenkyu). Nagoya Shiritsu Daigaku Igakkai Zasshi (J. Nagoya City Univ. Med. Assoc.), 16(4):1153-1179, 1966. 45 refs. Translated from Japanese. 56p.*

To study the in vivo action mechanisms of beryllium, tests were performed on rabbits with intravenous and subcutaneous inoculations of beryllium sulfate and intramuscular inoculations of beryllium oxide plus Freund adjuvant. Measurements were made of serum protein and a comparative study was made of other types of biological reactions. In the intravenous and intramuscular BeSO4 groups, a decrease in albumin and an increase in gamma globulin was observed. The albumin/globulin ratio dropped, and these changes were proportional to the quantity administered. Weight reduction and anemia proportional to the quanity administered was also observed. The principal damage was a reduction in liver function and degeneration and necrosis of liver tissue, all of which corresponded with changes in the serum protein. In the BeO plus Freund adjuvant intramuscular inoculation group, a characteristic increase in gamma globulin and an associated increase in total proteins was observed during the 7th-8th week after the beginning of the tests. No weight reduction, changes in peripheral blood, or liver damage was noted. An acceleration of reticuloendothelial functions in the liver and spleen was observed. The beginning of positive reactions in the skin patch test coincided with the period of increased gamma globulin. The changes in the serum protein were caused by beryllium sensitization. There are two aspects in the in vivo mechanisms of beryllium: poisoning and sensitization centering in liver damage. (Author conclusions modified)

23782 APTIC NO. 42392

Malorny, Guenther

GENERAL REVIEW ON THE ACTION OF CARBON MONOXIDE ON MAN. STATE OF THE ARTS OF THE CARBON MONOXIDE EFFECTS RESEARCH GROUP ACTIVITY. *(Allgemeiner Ueberblick ueber die Wirkung von Kohlenmonoxid auf den Menschen. Stand der Forschungsarbeiten in der Arbeitsgruppe Kohlenmonoxid-Wirkung. Text in German. Staub, Reinhaltung Luft, 32(4):131-142, April 1972. 25 refs. (Presented at the VDI (Verein Deutscher Ingenieure) Clean Air Maintenance Committee, Carbon Monoxide, Symposium, Duesseldorf, West Germany, Oct. 28-29, 1971.)*

Results of pharmacological, toxicological, neurological, biochemical, and neuropathological investigations into the effects of carbon monoxide, particularly in low concentrations, on man and animals are reviewed. The CO effect was directly proportional to the product of CO concentrations and exposure time. Considerable impairment of the muscular and physical performance of rats and mice due to 100-300 ppm of CO and decrease of the spontaneous motility of mice after or during exposition to 84 and 100 ppm were observed. The reaction latency increased by about 15% with 10% of carboxyhemoglobin. Both conditional and unconditional flight reactions of rats were suppressed after intermittent exposures to 150-250 ppm over 10 weeks. Excitatory effect of 60 ppm of CO on monosynaptic and polysynaptic reflexes of cats was observed. Tissue hypoxia due to hypocapnia was determined, while hypoxia due to oxygen deficiency and CO effect was different. Increase in the alpha 2-globulin content due to acute poisoning and reduced albumin as well as increased gamma globulin content due to chronic exposure in the serum and brain proteins were detected. Electroencephalographic tests revealed reduced brain current frequency due to CO. The results indicate that values of 8 ppm (24 hour mean) and 40 ppm (1 hour mean) should be selected as limits for the maximum allowable CO concentration in ambient air.

23783 APTIC NO. 42698

Mappes

DIRECTIONS FOR LEAD DETERMINATION IN BLOOD AND URINE WITH DITHIZONE. *(Vorschrift zur Bleibestimmung in Blut and Urin mit Dithizon). Preprint, Staatliche Gewerbearzt fuer Westfalen (West Germany), 1968. Translated from German. Leo Kanner Assoc., Redwood City, Calif., 6p., Dec. 1971.*

A detailed description of the determination of lead in blood and urine by the use of dithizone is given. The wet ashing is performed with sulfuric acid, nitric acid and perchloric acid. In the continued course of the analysis, precipitation through citrate is avoided and other dithizone metals are masked by potassium cyanide for tin, indium, bismuth, and thallium, which do not interfere for a variety of reasons. A detailed description of the determination of lead in dust which also contains soot and sulfate is given. Possibly present tetra-valent lead is reduced to bi-valent lead by heating the sample of dust with hydrochloric acid. The final sample solution may be diluted with addition of ammonium citrate according to the lead content.

23784 APTIC NO. 42385

Matsumura, Y.

AIR POLLUTION AND ALLERGY. *(Taiki osen to arerugi). Text in Japanese. Kuki Seijo (Clean Air -J. Japan Air Cleaning Assoc., Tokyo), 9(7):66-71, Feb. 1972. 16 refs.*

The effect of air pollution on allergic asthma caused by allergens, and the effect of re-invasion of the allergens are discussed. It seems that air pollution does not directly cause allergies. However, experimental results reveal that when egg albumin, labeled with I(131) is injected into the respiratory tract and lungs of guinea pigs after they are exposed to ozone, radioactivity in the blood is higher, and the antigen invasion from the lung is promoted compared to the control group. The same results are found with rabbits, rats, and guinea pigs exposed to sulfur dioxide or nitrogen dioxide. Twelve of 16 guinea pigs exposed to 5 ppm of ozone for 30 minutes die after inhalation of albumins. Inhalation of a chemical mediator, such as acetylcholine, by asthma patients results in a significant change of one second breathing capacities, but has no effect on health persons.

23785 APTIC NO. 43180

Mellins, Robert, B. and C. David Jenkins

EPIDEMIOLOGICAL AND PSYCHOLOGICAL STUDY OF LEAD POISONING IN CHILDREN. *J. Am. Med. Assoc., 158(1):15-20, May 7, 1955. 5 refs. (Presented at the American Federation for Clinical Research Midwestern*

Section, Annual Meeting, 12th, Chicago, Ill., Oct. 28, 1954.)

An interest in lead poisoning in children by physicians led to the discovery of 21 cases in Chicago during 1953. Five cases were fatal. The children ranged in age from 10 to 44 months. Pica was the outstanding precursor in all cases. Symptoms appeared mostly during the summer. A behavioral syndrome, characterized by irritability, fearfulness, weakness, withdrawal, and unexplained crying, occurred one to two weeks prior to hospitalization. Anemia, basophilic stippling of erythrocytes, increased coproporphyrinuria, elevated urin and blood lead levels, and transverse bands of increased density at the terminal segments of growing bones on roentgenograms confirmed the diagnoses. The cases were city-wide but largely confined to slum areas. Painted walls and window sills were the two commonest sources of lead. Fifteen children were studied four to six months after discharge from the hospital. Prior to the onset of lead poisoning, only one of the 15 was retarded in motor development. Three were slow in speech development, and six were emotionally immature. Pica was of the aggressive biting rather than sucking variety, and was directed, not random, behavior. A nutritional basis could not be found. Six months subsequent to the illness 14 were found to be markedly retarded in some way. Language ability and finer muscle control were disturbed. Ten children became much more emotionally unstable. Short attention span and high variability on psychological tests were characteristic. (Author summary modified)

23786 APTIC NO. 43278

Ment, Jack De

SOME NEW VIEWS OF TUMOR GENESIS. *West. J. Surg. Obset. Gynecol., 1950:430-439, Aug. 1950. 44 refs.*

Tumor genesis, including causes and growth behavior, is examined as an electrophysical fact, based on the theory of piezoelectricity. When certain crystals are stressed, they generate an electric current. The crystalline substances which behave in this manner are piezoelectric and have certain common characteristics: piezoelectric crystals must lack a center of symmetry, and they must generally be nonconductive to electricity. Always associated with piezoelectric behavior is the inverse property of electrostriction, the development of stress (contraction and expansion) as a result of the application of an electric field to a material. Studies have shown the presence of piezoelectric dusts in the tissues of rats and rabbits evoke a decided fibrotic tissue growth, whereas dusts without crystalline structures do not produce an effect beyond foreign body incapsulation. The piezoelectric dusts tested included aluminum phosphate, berlinite, tourmaline, barium titanate, and wulfenite. Chronic irritation, proposed as causative in certain tumors, appears equivalent to the primary energy, over a period of time, involved in the piezoelectric phenomena. Several types of energy sources which may initiate the piezoelectric effect of crystalline dusts in tissues are considered, including radio frequency, thermal energy, friction, and penetrating radiations. Certain known carcinogens, the hydrocarbons in particular, have certain common characteristics which are similar to those of piezoelectric materials. The possibility of using a piezoelectric or other transducer dust in the treatment of malignant growths is described.

23787 APTIC NO. 43485

Merville, R., J. Dequidt, and J. -M. Haguenoer

EXPERIMENTAL BERYLLIUM DISEASE IN RATS. DISTRIBUTION - ELIMINATION. *(A propos de l intoxication experimentale par le beryllium chez le rat repartition - elimination). Bull. Soc. Pharm. Lille, vol. 2:103-110, 1967. 2 refs. Translated from French. 10p.*

Beryllium sulfate was given by intraperitoneal injection to induce both acute and chronic beryllium disease in rats. Five series of experiments were conducted to determine the distribution of beryllium in the organs and its elimination in the urine. Substantial concentrations of beryllium were observed in the spleen and liver. Workers in beryllium metallurgy are exposed to the inhalation of harmful dusts or vapors at different stages of manipulation, from grinding and crushing of the ore to its processing thereof, where accidents are aided by the volatility of certain intermediate products. In these cases, the disease is primarily acute. The chronic form of the disease occurs as a result of accidents in the fluorescent lamp industry, during the manufacture of fluorescent powders and their introduction into the tubes, and during the accidental or voluntary breaking of defective tubes. In the acute disease, rapid breathing, cyanosis, dermatoses ulcers, and ulcerative granuloma are observed. In the long-term disease, berylliosis, lung symptons accompanied by general disorders, skin infections, kidney lesions, and joint infections are observed.

23788 APTIC NO. 42759

Moeschlin, Sven

INORGANIC POISONS. METALS. LEAD (PB). *In: Poisoning. Diagnosis and Treatment. New York, Grune and Stratton, 1965, p. 45-71. 139 refs. Translated from German by Jenifer Bickel.*

The toxic effects of lead in humans are reviewed. As with other metals, the toxic effect of the lead atom is most likely due to its integration into different cellular enzymes. The disturbance of normal porphyrin metabolism appears to play a significant part. An early sign of lead poisoning is the blockage of porphobilinogen synthesis through inhibition of the combination of two molecules of delta-aminolevulinic (ALA) acid. A high level of ALA in the urine is one of the best indicators of early lead hazard. The most common subjective symptoms of lead poisoning are weakness, anorexia, tiredness, nervousness, tremor, nausea, loss of body weight, headache, and gastric pain. Objective symptoms include constricted arterioles, loss of weight, increased delta-aminolevulinic aciduria, porphyinuria, constipation, blood and bone marrow changes, lead line along the margin of the gums, and weakness of extensor muscles. Lead encephalopathy is also considered. Specific and symptomatic treatments for chronic lead poisoning are described. 2-1125 Smith, I. C. Laws and Regulations A alifornia Prevention sposal

23789 APTIC NO. 43522

Mukhina, S. T.

EFFECT OF MAGNESIUM ON OXIDATIVE PROCESSES IN RAT LIVER AND LUNG HOMOGENATES AS A RESULT OF EXPERIMENTAL BERYLLIUM INTOXICATION. *(Vliyaniye magniya na protsessy okisleniya v gomogenatakh pecheni i legkikh krys pri eksperimental noy berilliyevoy intoksiktatsii). Gigiena Truda i Prof. Zabolevaniya, 11(1):43-46, 1967. 17 refs. Translated from Russian. 8p.*

Beryllium and magnesium salts in solution were administered to three groups of rats in different combinations. The first group included rats receiving only BeSO4; the second group included rats administered MgSO4, 0.7 g/kg, immediately before investigation of oxidative processes; the third group was composed of rats receiving magnesium simultaneously with beryllium in equimolar amounts. Magnesium to some degree reduces the toxic effect of Be on the enzymes of the tricarboxylic cycle. Competitive relationships between Be and Mg found in experiments in vitro occur also in the intact organism. The administration of Mg partially alleviates the toxic effect of Be on the processes investigated.

23790 APTIC NO. 43320

Nagaoka, Shigeru

REPORT OF THE INVESTIGATION ON THE EFFECTS OF CARBON MONOXIDE IN THE AIR ON HUMAN BODIES. *(Taiki chu no issankatanso no jintaieikyo ni kansuru chosahokoku). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot., no. 3:211-215, 1972.*

The effects of carbon monoxide contained in auto exhaust gases on human bodies were investigated. As an indicator of the effects of auto exhaust gases, CO concentration in the expired air was used, and an investigation on various working conditions, reaction time, and fatigue was also made. This investigation was carried out twice in June when there was no heating effect and in Nov. 1970. The subjects were mostly bus drivers and conductors (mostly female). The CO concentrations in the open air were 5-10 ppm. The CO concentrations in the expired air of drivers were classified by the amount of cigarette smoking and were expressed in a frequency distribution. Carbon monoxide concentrations in expired air kept pace with the increase of the amount of cigarette smoking. In smokers who smoked 15-24 cigarettes a day, the CO concentration in the expired air tended to be higher in smokers who inhaled deeply. The mean value of CO concentrations in drivers was 15 ppm, even among non-smokers, and this value was higher than that in general non-smokers (5-10 ppm). In June, both drivers and conductors showed an increase of CO amounts in expired air at the end of the work day. This was caused by the effects of CO in the working environment.

23791 APTIC NO. 42818

Nettesheim, P. and A. K. Szakal

MORPHOGENESIS OF ALVEOLAR BRONCHIOLIZATION. *Lab. Invest., 26(2): 210-219, 1972. 23 refs.*

So-called bronchiolization of alveoli was observed in mice chronically exposed to synthetic smog (ozonized gasoline fumes) or calcium chromate dust. The epithelial cells lining the affected alveoli were identified by electron microscopy as typical bronchiolar cells. Basement membrane pores were often found in the bronchiolar walls of exposed mice, laterally connecting the bronchioles with adjacent alveoli. In animals exposed to synthetic smog, these openings were always occupied by cells resembling bronchiolar epithelium. In CaCrO4-exposed animals with bronchiolar epithelial hyperplasia, the pores appeared to have developed into small bronchiolar-alveolar channels with a patent lumen and a length of two to three cell diameters. Bronchiolar epithelialization was seen only occasionally in age-matched control animals; openings in the basement membrane have not yet been identified in controls. It is proposed that colonization of alveoli with bronchiolar cells via bronchiolar-alveolar pores is one morphogenetic mechanism of alveolar bronchiolization. (Author abstract modified)

23792 APTIC NO. 42421

Ohki, Kosuke

A STUDY ON THE ELECTRONIC STRUCTURE OF THE MOLECULAR POLLUTION SUBSTANCES. *(Denshi kozo kara mita kankyo osen inshi). Text in Japanese. Kagaku No Ryoiki (J. Japan. Chem.), 25(10):1146-1152. Oct. 1971. 11 refs.*

Various pollutants, including metal catalysts, agricultural chemicals, pharmaceutical compounds, and food additives are discussed in terms of their electronic structures. Third-period transition metals possessing electrons are considered to be catalysts whose activity usually disturbs biological reactions in animals, even though few metals play important roles in the body. Chlorinated organic compounds such as DDT, benzene hexachloride, polychlorinated biphenyls, chloroform, and perchlorobenzyl alcohol have been effectively used as insecticides. The chlorinated compounds do not exhibit acute toxicity, but show chronic toxic actions. In the last 20 years, approximately 2 million tons of chlorinated chemicals have been spread throughout Japan. Although the chlorine atom does not have an electron at its 3rd orbital, the orbital interactions between s, p, and d orbitals make possible the use of the d orbital. Therefore, in an organic chlorinated compound, the formation of a d(Pi)-p(Pi) orbital is likely to occur. This facilitates decomposition of the atom to a radical which will probably cause chronic poisoning in the animal body.

23793 APTIC NO. 43174

Okumura, M. and S. Katsuki

A CLINICAL STUDY OF OIL DISEASE (CHLORINATED BIPHENYL POISONING) PARTICULARLY THE INTERNAL MEDICAL SIGNS. *(Iwayuru Yusho (Enka Bifueniru Chudoku) no rinshoteki kenkyu tokuni naikateki shoken ni tsuite). Fukuoka Igaki Zasshi (Fukuoka Acta Med.), 60(6):440-446, 1969. 17 refs. Translated from Japanese by Translation Consultants, Ltd., Arlington, Va.*

The 24 subjects examined were divided into adults and juveniles using the age of 15 as the boundary. The 18 adults were divided on the basis of the seriousness of the disease, using the dermatological findings, into nine subjects in the serious group and nine subjects in the medium and lighter group. Among the adults, in addition to the characteristic eye symptoms and acneiform eruptions, fatigue, loss of weight, abnormal menstruation, and fever were observed in a large number, the frequency of these signs being higher in the serious group. One subject had delivered a stillborn infant with skin symptoms and one had delivered a new-born baby with strong skin pigmentation. A comparison of the various test findings between the two groups showed that there were more in the seriously ill group who tended towards anemia, increases in leukocytes, accelerated blood cell precipation rate, a slight increase in the alkali phosphatase and BSP accumulation, abnormalities in serum protein fractions, abnormal serum metals, and an increase in the serum chlorine value. Although no correlation with the seriousness of the symptoms could be observed, it is characteristic of this condition that there is an increase in serum lipids, particularly triglyceride. This trend was particularly marked in the juvenile subjects. The effect of secondary infection of the skin eruptions on the clinical pictures is not yet certain. (Author summary modified)

23794 APTIC NO. 43620

Oliver, W. T. and H. S. Funnell

DETERMINATION OF ARSENIC IN BIOLOGICAL MATERIAL. *Anal. Chem., 31(2):259-260, Feb. 1959. 10 refs.*

A method for the determination of arsenic in animal and plant tissue is described. The homogenized tissue was mixed with concentrated hydrochloric acid in a flask fitted with a cold finger condenser and heated on a water bath until the sample liquefied. The arsenic was evolved as arsine and collected on cellulose containing mercuric iodide overlayered with mercuric iodide. The arsenic was eluted with iodine solution from the resulting mercury-arsenic compound. Alginate was incorporated in the eluent to act as a stabilizer for the colloidal molybdenum blue which was ultimately developed. The method tested in a range from zero to 50 micrograms of arsenic showed recovery results averaging from 99.5 to 100% with a standard deviation of + or 0.52.

23795 APTIC NO. 43521

Orlova, A. A. and P. A. Rozenberg

OXIDATIVE PROCESSES IN PRONOUNCED FORMS OF BERYLLIOSIS. *(Sostoyanie okislitel nykh protessov pri vyrazhennykh formakh berillioza). Gigiena Truda i Prof. Zabolevaniya, vol. 13:22-25, April 1969. 6 refs. Translated from Russian. 7p.*

The dynamics of the oxidative processes in pronounced forms of chronic berylliosis and the characteristics of the biochemical deviations were studied. Three patients with pronounced berylliosis were observed. To judge the presence of disturbances in oxidative processes, the acidogenic factor (ratio of amount of organic acids to total nitrogen) in the daily amount of urine was used. A normal acidogenic factor is 3.9 7.0. Prolonged dynamic observations showed that aggravation or complication of the disease is accompained by a disturbance of oxidative processes, indicated by a sharp increase in the acidogenic factor. At the same time, the excretion of amino acids increases. In an especially severe case, when large-vesicular emphysema, massive pleurodiaphragm concretions, atelectasis and cirrhosis of the lungs were formed against a background of granulomatous changes, and a high erythrocyte content and viscosity were noted in the peripheral blood, the pathologic course of oxidative processes was maintained for several months. In patients with a severe condition, the acidogenic factor and the amount of organic acids were increased in proportion to the severity of the disease.

23796 APTIC NO. 43489

Ozerva, V. V.

FUNCTIONAL STATE OF THE ADRENAL CORTEX IN BERYLLIOSIS. *(Funktsional noye sostoyaniye kory nadpochechnikov pri berillioze). Klinich Med., 44(11):30-35, Nov. 1966. 16 refs. Translated from Russian. 11p.*

Functional investigation of the adrenal cortex by the method of three-day stimulation with adrenocorticotropic hormone (ACTH)-zinc- phosphate was carried out in 31 patients suffering from chronic berylliosis of the first, second, and third stages, and in 13 persons working with beryllium. In the majority of patients with chronic berylliosis, there was a normal excretion of 17 oxycorticosteroids; functional investigation of the adrenal cortex after the introduction of 40 units of ACTH showed a reduction of its present and potential reserves. In healthy persons working with beryllium, there was normal function of the adrenal cortex. In persons working with beryllium and manifesting individual symptoms suspicious of chronic berylliosis, there was a normal discharge of 17-oxycorticosteroids and a decrease of potential glycocorticoid reserves of the adrenals. An investigation of the androgenic function of the adrenal cortex revealed a normal excretion of 17-ketosteroids in all women working with beryllium and in patients with chronic berylliosis, as well as its decrease in comparison with control data in men suffering from chronic berylliosis and in men manifesting individual symptoms suspicious of chronic berylliosis. (Author abstract modified)

23797 APTIC NO. 42713

Passow, H., A. Rothstein, and T. W. Clarkson

THE GENERAL PHARMACOLOGY OF THE HEAVY METALS. *Pharmacol. Rev., vol. 13:185-224, 1961. 130 refs.*

A number of selected experiments concerned with a few representative heavy metals are presented. Examples were selected primarily to illustrate certain factors governing the interactions between heavy metals and cellular ligands and the metal-induced changes in the physiological state of the cells or animals. The interactions of heavy metals with simple molecules, proteins, and enzymes are summarized. In the case of enzymes, emphasis is placed on the different ways that metals can influence enzyme activities. The interactions of metals with cells is given a detailed description. The topics considered include graded responses of the cell membrane, all-or-none responses of the cell membrane, the action of metals on the interior of the cell, and time dependence of metal actions. A shorter and less detailed description is devoted to the mechanisms of heavy metal interactions at the organ and whole animal levels. The metals considered include: manganese, mercury, silver, lead, copper, and uranium.

23798 APTIC NO. 43209

Plum, Fred, Jerome B. Posner, and Raymond F. Hain

DELAYED NEUROLOGICAL DETERIORATION AFTER ANOXIA. *Arch. Internal Med., vol. 110:56-63, July 1962. 30 refs.*

The clinical and pathological picture of delayed postanoxic encephalopathy is illustrated by five cases of which two had autopsies. Delayed and similar neurological deterioration followed carbon monoxide poisoning, anoxic anoxia, anesthesia, and cardiac arrest. Cerebral hemispheric demyelination without significant neuronal damage was the consistent pathological abnormality both in these cases and in the literature. The pathogenesis of this illness is unknown. Attempted explanations invoking direct carbon monoxide toxicity, vascular damage, cerebral edema, and hypersensitivity reactions all possess either serious omission or are contradicted by extant data. Although there are no satisfactory validated measures which will prevent delayed postanoxic encephalopathy, it is suggested that avoiding early physical activity may be prophylactic. (Author summary)

23799 APTIC NO. 43486

Potapova, I. N. and N. I. Seleznev

CHANGES IN THE THIN STRUCTURE OF THE LUNGS IN EXPERIMENTAL BERYLLIOSIS. *(Izmeneniya tonkoy struktury legkogo pri eksperimental nom berillioze. Arkh. Patol., 29(7):15-19, 1967. 10 refs. Translated from Russian. 9p.*

Electron microscopy was applied to the study of experimental berylliosis in rats. There were changes of mitochondrial apparatus of the cellular elements (of disintegration and swelling type, with a preponderant loss of cristae). During the first days of the experiment the basal membranes of the alveolar septi became edematous and swollen; later they became denser and simultaneously thicker, this corresponding to the development of desquamation process of cells lining the alveoli and to selerosing of alveolar septi. (Author abstract)

23800 APTIC NO. 43487

Potapova, I. N.

CHANGES IN THE LUNGS AND BIFURCATED LYMPH NODES IN EXPERIMENTAL BERYLLIOSIS. *(Ob izmeneniyakh v legkikh i bifurkatsionnykh limfaticheskikh uzlakh pri eksperimental nom berillioze). Arkh. Patol., 29(8):61-68, 1967. 49 refs. Translated from Russian. 18p*

Changes occuring in experimental berylliosis are subdivided into two periods: during the first period (up to 1 month) the toxic effect of the agent manifests itself, and during the second (1-12 months) there are processes of sclerosing and elimination of beryllium oxide from the lungs with the lymph flow. Beryllium granulomas begin to form from the 2nd day, sclerosis being developed in them from the 7th day. Pneumonitis processes and desquamation of alveolar epithelium are explained by changes in the basal membrane structure in the alveolar septi. Replacement of eosinophilia by plasmatization in the lungs confirms the significance of the allergic factor in berylliosis. In intravenous injection to rabbits, granulomas are chiefly formed in the vascular system of the lung. (Author abstract)

23801 APTIC NO. 43519

Potapova, I. N.

MORPHOLOGY OF INITIAL CHANGES IN THE LUNGS DURING EXPERIMENTAL BERYLLIOSIS. *(K morfologii nachal nykh izmeneniy v legkikh pri eksperimental nom berilloze). Gigiena Truda i Prof. Zabolevaniya, vol. 13:49-51, March 1969. Translated from Russian. 5p.*

White rats were given intratracheal injections of beryllium oxide in doses of 5 mg; they were killed 1, 3, 7, 14, 30, and 90 days after injection. The material was fixed in acid and neutral formalin, Zenger and Carnot fixatives, and alcohol. Slices were stained with hemotoxylin-eosin and Sudan III. Beryllium oxide dust and lungs of rats were studied by electron microscopy three months after the start of the test. Beryllium granulomae appeared in the lungs in the first days of the test. Their center is formed of beryllium-protein complexes. The cellular composition of the granulomae is polymorphous. Collagenous fibers appear from the 7th day and their number gradually increases. Eosinophilia in the lungs and bifurcated lymph nodes, alternating with plasmatic tissues, indicate the presence of allergic reactions and immunologic shifts during berylliosis. Electron microscope data indicate disturbances to mitochondrial structure in cellular elements, partially explain the desquamation of alveolar epithelium, and confirm increased proliferation processes and the early development of sclerosis in the lungs.

23802 APTIC NO. 43559

Prendergast, W. Dowling

THE CLASSIFICATION OF THE SYMPTOMS OF LEAD POISONING. *Brit. Med. J. (London), vol. 1:1164-1166, May 14, 1910.*

Two main systems of classification of lead poisoning symptoms may be made. The first deals with the action of lead on the brain and nervous system, the sensory-motor apparatus, and the involuntary muscles. The second system, which is described in detail, is divided into two headings: Saturnina mitior and Saturnina gravior. The symptoms of Saturnina mitior include digestive disorders, cachexia, slight blue line on the gums, slight colic, anemia, pain in the trunk and limbs, loss of appetite and vomiting, polyurea, and slight albuminaria. If the individual continues to absorb lead, the symptoms of Saturnina gravior appear. These include marked cachexia and emaciation, acute prolonged colic, fetid breath, paralysis of the arms and legs, a well-marked blue line on the gums, acute pains in the head, disturbance in vision, tremors, suppression of urine, and convulsions.

23803 APTIC NO. 43196

Prerovska, I. and J. Teisinger

EXCRETION OF LEAD AND ITS BIOLOGICAL ACTIVITY SEVERAL YEARS AFTER TERMINATION OF EXPOSURE. *Brit. J. Ind. Med. (London), vol. 27: 352-355, 1970. 12 refs.*

A group of 27 persons who had been treated some years previously for chronic lead poisoning, and who had not come into occupational contact with lead since, was examined. Half of them had had no occupational exposure to lead for 3-5 yrs and the others for 8-17 yrs. In most of these persons there was still an increased lead excretion, originating from an increased deposit in the bones. The mobilization test after calcium versenate injection was greater than 0.350 mg/24 hr. The values found for hemoglobin, punctate basophilia, coproporphyrin and delta-aminolevulinic acid in urine were normal, but there was, in all cases, a decreased delta-aminolevulinic acid-dehydrase activity. The finding that lead is biologically active in very low concentrations raises a host of questions, such as what other enzymes or biological systems are affected by lead and perhaps by other metals. (Author abstract modified)

23804 APTIC NO. 42633

Racóveanu, Carmen, M. Manicatide, and V. Nicolaescu

EPIDEMIOLOGIC STUDY OF CHRONIC BRONCHITIS IN TWO REGIONS WITHOUT INDUSTRIAL AIR-POLLUTION. *Text in Rumanian. Stud. Cercet. Med. Interna, 12(4):359-367, 1971. 27 refs.*

The incidence and prevalence of chronic bronchitis among inhabitants of two regions free of industrial air pollution was studied. The investigation was conducted in two groups of 300 subjects each, using standard questionnaires, clinical examinations, and respiratory function tests which included bronchial reactivity to acetylcholine. The incidence of chronic bronchitis was higher among the inhabitants of the mountainous region than among those in the Danube Delta. The probable relationship between the higher incidence of chronic bronchitis in the mountain village and the bronchial reactivity which was also more marked in that region are discussed. Correlations were made between the incidence of chronic bronchitis and the smoking habits and lung diseases of the last three years. (Author summary modified)

23805 APTIC NO. 43232

Rawal, M. L., M. N. Rao, N. H. Wadia, T. P. Niyogi, M. N. Gupta, M. K. Chakraborty, and B. K. Sengupta

REPORT OF MANGANESE POISONING ENQUIRY COMMITTEE. *Ministry of Labour and Employment, New Delhi (India), Manganese Poisoning Enquiry Committee, 143p., 1960. 48 refs.*

The causation, extent, clinical symptamology, diagnosis, and treatment of the different types of manganese poisoning were investigated and the preventive measures that may be enforced were also considered. Twelve of the 619 mines in India were studied, four of which were in Bombay and five in Madhya Pradish. Mines were also studied in Gujerat, Orissa, and Mysore to obtain a cross sectional view of the mines and workers. A ferromanganese plant was included to observe the effect of manganese fumes on the human system. The living environment, i.e., housing, water supply, waste disposal, food and dietary habits, and welfare activities, and the working environment, including dust concentrations and ventilation, were studied. The investigations were conducted in the field, in laboratories, and in hospitals. A total of 1132 workers were examined at the work site. Nine workers who showed signs of manganese poisoning were admitted to a hospital for detailed studies. The field investigation included a complete medical and occupational history, clinical, hematological, and radiological examinations. Environmental studies included an assessment of the dust hazard and the thermal environment. Further examination of dust and water samples was done in the laboratory. Animal experiments were also conducted.

23806 APTIC NO. 42788

Reisner, Manfred, Klaus Robock, and Joseph Stuke

ASSESSMENT OF DUST IN COAL MINES FROM THE STANDPOINT OF INDUSTRIAL HYGIENE. *(Gewerbehygienische Beurteilung des Staubes im Steinkohlenbergbau). Text in German. Glueckauf (Essen), 107(26): 980-986, Dec. 1972. 30 refs.*

Studies conducted in the German coal mining industry over the last ten years, concerning the specific effects of dust on lung tissue, have led to the conclusion that quartz, as a component of dust, does not have to be considered harmful as long as the concentration amounts to less than 5% of the total fine dust concentration. It has been proven that changes in the lung, observed in X-ray photographs and diagnosed as pneumoconiosis, are primarily due to the accumulated effect of dust exposure. This recognition had led to a system of work force administration which will ensure that, in the work assigned to a miner, a temporary high exposure to dust will be compensated by a subsequent lower one, or that in case of a high concentration of fine dust, the exposure time will be kept correspondingly shorter, and vice versa. The latest recommended value of a maximum allowable concentration for fine dust is 4 mg/cu m of air, provided the quartz content within the dust does not exceed 5% by weight. Particles under 5 micron in size are defined as fine dust. Statistical details are presented concerning dust conditions in relation to the spread of pneumoconiosis, as well as data on chemical composition, semi-conductor properties, and biological toxicity of dusts established with test animals.

23807 APTIC NO. 42390

Rispoli, Jose A., Norma L. De Sobel, Carlos H. Spector, Damian D. Torti, Carlos Urquijo, and Alberto L. Massun

EPIDEMIOLOGIC SURVEYS ON AIR POLLUTION. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd Washington, D. C., 1970, p. 201-209. (Dec. 6-11, Paper MB 21B.)*

In a study conducted at the Railroad workers Institute for Thoracic Diseases, 200 cases of lung cancer were observed from the 11,977 medical records collected between 1957 and 1966. Of the 188 men, specific activity in the railroad system could be recorded for 157, of which 42 were railroad engineers and firemen, in direct and prolonged contact with coal, wood, and oil burning gases. A medical examination of operating personnel on diesel locomotives revealed that mucosal irritation was a frequent symptom. Investigations carried out at the Instituto de Oncologia in order to demonstrate an association between lung cancer and smoking habits are also reported and correlated with age and sex. In a survey conducted among lung cancer cases in non-smoking female patients, a considerable number were observed to have ironed for years with coal heated irons. An investigation of the influence of air pollution on respiratory health, especially chronic bronchitis, was conducted.

23808 APTIC NO. 43338

Robertson, B., G. Enhorning, and Eva Malmquist

QUANTITATIVE DETERMINATION OF PULMONARY SURFACTANT WITH PULSATING BUBBLE. *Scand. J. Clin. Lab. Invest., 29(1):45-49, Feb. 1972. 12 refs.*

Surface-active lipids in alveolar wash from fats were concentrated by centrifugation for 1 hr, at 4 C and 1000 times g. The resulting pellet was resuspended in a series of dilutions, and the surface properties of these suspensions were analyzed with pulsating bubble. The pressure amplitude across the air-liquid interface of the pulsating bubble showed a statistically significant correlation with the phospholipid content of the sample at concentrations less than or equal to 0.27 mmo/P/l. The correlation between these two variables was negative, although statistically not significant, at higher phospholipid concentrations, probably due to overcrowding of the bubble wall with surface-active molecules. The pulsating bubble method seems adequate for quantitation of the functional capacity of pulmonary surfactant, although correlation between surface properties and phospholipid concentration of the wash are probably less valid in cases of qualitative alterations within the surfactant system, as suggested by previous observations on paraquat-induced experimental respiratory distress in rats.

23809 APTIC NO. 42881

Rondia, D.

TOXICITY OF ENGINE EXHAUST GASES. *(Toxicite des gaz d echappement de moteurs). Text in French. Cent. Belge Etude Doc. Eaux, 25 (338):33-40, Jan. 1972. 12 refs.*

The toxic effects of engine exhaust components (carbon monoxide, lead compounds, and hydrocarbons) and results of concentration measurements in cities are reviewed. Carbon monoxide concentrations in urban areas with high traffic density averaged 7 ppm. The concentrations over sidewalks ranged from 10-25 ppm, and those inside cars were about three times higher than outside, reaching 100 ppm in some cases. The CO concentrations measured in tunnels and congested traffic were 40-60 ppm. The toxic effect of CO is usually determined by hemoglobin CO content. The primary reactions between CO and hemoglobin are completely reversible. The quantity of CO incorporated in hemoglobin is a function of the atmospheric CO concentration, exposure time, and respirations rate. Some 20% of the CO inhaled is blocked in myoglobin. Visual acuity is impared by a COHb content of 2.5%, and 5% of COHb causes significant modification of the psychomotor response. Chronic poisoning tests on rats revealed inactivation of liver enzymes responsible for metabolizing organic poisons and morphological modifications in both cerebrum and myocardium. Some 80% of the lead added to gasoline is discharged in the form of fine particles (below 1 micron) of bromide, chloride, and lead oxide; 20-50% of the particles is resorbed by the lungs and 10% by the digestive tract. The blood lead content in urban inhabitants is 30 micrograms/100 ml, while the lead concentration in city air is 1-3 micrograms/cu m. Lead causes anemia by inhibiting hemoglobin synthetizing enzymes. Lead accumulation in the organism increases with increased lead concentrations in air and food. While aliphatic hydrocarbons are of relatively low toxicity, certain particulate polycyclic hydrocarbons, formed especially at low engine speeds, are carcinogenic. Concentration measurements indicate the major role of automobiles as polycyclic hydrocarbon emission sources in comparison with domestic heating.

23810 APTIC NO. 43637

Rondia, Desire

IN VIVO REDUCTION OF THE LIVER BENZOPYRENE HYDROXYLASE ACTIVITY AFTER CARBON MONOXIDE INHALATION. *(Abaissement de l activite de la benzopyrene-hydroxylase hepatique in vivo apres inhalation d oxyde de carbone). Text in French. C. R. Acad. Sci. Paris, Ser. D., 271(6):617-619, Aug. 1970. 2 refs.*

The effect of carbon monoxide on the liver benzopyrene hydroxylase activity was studied on male Wistar rats. The benzopyrene hydroxylase activity was determined by in vitro fluorometric measurement of the non-metabolized benzo(a)pyrene and the hydroxy- 3-benzo(a)pyrene formed during the experiment. The individual variability in the values was 10-15%. The reduction in the benzopyrene hydroxylase activity due to 60 ppm of CO was about 13%, while 100 ppm of CO caused a reduction of about 20% after 120 hours. The increase in the enzyme activity after 48 hours exposition was not significant. The results indicate modification in the composition of the reticuloendothelial system of rat liver due to minor anoxia, and specific effect of CO on a liver hydroxylase. The spectrophotometric techniques applied did not permit the hydroxylase in question to be identified.

23811 APTIC NO. 42707

Roth, Roland Phillip

GASEOUS AIR POLLUTANTS AND THE SECRETOMOTOR ACTIVITES OF THE GASTROINTESTINAL TRACT. *Temple Univ., Philadelphia, Pa., Dept. of Environmental Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., April 1971. 74p. 32 refs.*

The pertinent literature and some theoretical considerations concerning the deleterious effects of gaseous and other atmospheric contaminants on the digestive system are briefly reviewed. An atraumatic intragastric balloon technique is presented whereby gastric motor function is directly recorded from conscious, unrestrained rats continuously for as many as five days and intermittently for periods of up to two weeks. Conceivably, this technique might be extended to other small laboratory animals in physiologic and pharmacodynamic studies. Among the gaseous air pollutants, carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide singularly at near ambient concentrations have no discernable effect on gastrointestinal motility in the rat. However, toxicological concentrations of these pollutants do produce gastric inhibition, while not affecting small intestinal motor activities. The inhibitory response is probably due to the irritating properties of the gases acting on the lower respiratory passageways, presumably via a pulmono-gastric reflex. (Author summary modified)

23812 APTIC NO. 42714

Rothstein, Aser

CELL MEMBRANE AS SITE OF ACTION OF HEAVY METALS. *Federation Proc., vol. 18:1026-1035, Dec. 1959. 30 refs.*

From an experimental point of view, two aspects of the action of heavy metals on cell membranes are of importance. The first is the nature of the membrane-metal reaction in a chemical sense. This is determined by the nature of the chemical entities present in the membrane, with which the metal can react. The second is the nature of the physiological disturbance, if any, resulting from the chemical alterations in the membrane. A few experiments are described which illustrate certain principles involved in analyzing toxic effects at a molecular level in the cell. The action of mercury and copper on muscle cells, the inhibition of enzymes in the cell surface, the action of the uranyl ion on yeast cells, and the breakdown of the yeast membrane treated with mercury are considered. Knowledge of the sensitivities of individual enzyme systems, in vitro, does not allow a prediction of action of the metals on the cell. The location of the metal sensitive sites in the cells is of greater importance than the inherent sensitivity of sites. Cytoplasmic systems are protected in two ways: the membrane acts as a diffusion barrier, and many physiologically inert substances in the cytoplasm react with the metal and reduce the amounts available to react with sensitive centers. Those systems closest to the membrane will tend to be the most susceptible.

23813 APTIC NO. 43488

Rozenberg, P. A. and A. A. Orlova

BIOCHEMICAL STUDIES OF CHRONIC BERYLLIOSIS. *(Biokhimicheskiye issledovaniya pri khronichoskom berillioze). Gigiena Truda i Prof. Zablovaniya, 11(12):33-37, 1967. 9 refs. Translated from Russian. 10p.*

Biochemical analyses carried out in 77 persons who had been exposed to the effect of metal beryllium, beryllium oxide, and beryllium bronze are reported. The examined persons had not handled these substances for 3 to 15 yrs. Persons who showed no clinical roentgenological symptoms of the disease but had been exposed to the effects of beryllium and its compounds (the contact group), as well as a number of patients suffering from chronic berylliosis, were found to have oxidation processes disturbed. This derangement is characterized by an increased acid production rate, and augmented passage of amino acids with the urine, and reduced sulfhydryl groups in the blood serum. In berylliosis patients, the activity of the blood serum. In beryllic[illegible] patients, the activity of the blood serum alkaline phosphatase is higher than in subjects in the contact and control group. (Author abstract modified)

23814 APTIC NO 43666

Rushkevick, O. P.

GREATER CIRCULATION HEMODYNAMICS IN SILICOSIS AND CHRONIC BERYLLIOSIS PATIENTS. *(Gemodinamika bol shogo kruga krovoobrashcheniya u bol nykh silikozom i khronicheskim berilliozom). Gigiena Truda i Prof. Zabolevaniya, vol. 12:55-57, April 1968. 5 refs. Translated from Russian. 7p.*

A study was conducted to investigate the greater circulatory hemodynamics in silicosis and chronic berylliosis patients. The peculiarities in the change in hemodynamics and the dependence of the observed changes on the clinical course of the disease and the state of respiratory function were also studied. Eighty-seven people were examined; 59 were silicosis patients and 28 were chronic berylliosis patients at different stages. Changes in greater circulation hemodynamics in silicosis patients are expressed by an increase in systolic and minute volumes, a heightening of the average and true systolic arterial pressure, and an increase in the elastic tension of vessel walls. Change in basic hemodynamic indices in silicosis patients has an effect on their regular connection with respiratory function and with the degree of cardiac compensation. In chronic berylliosis, as in silicosis, changes in greater circulatory hemodynamics are characterized by an increase in minute volume, a heightening of the average and true systolic arterial pressure, and a heightening of vessel rigidity. In chronic berylliosis, basic hemodynamic indices were changed in the initial stages of the disease. A dependence of these changes on pulmonary insufficiency and on the severity of the disease was revealed.

23815 APTIC NO. 42716

Sachs, Henrietta K., Lorry A. Blanksma, Edward F. Murray, and Morgan J. O Connell

AMBULATORY TREATMENT OF LEAD POISONING: REPORT OF 1155 CASES. *Pediatrics, 46(3):389-996, Sept. 1970. 5 refs.*

Subjects with lead concentrations greater than 50 micrograms/100 ml whole blood were referred to a Chicago municipal lead poisoning clinic for evaluation. Chelating agents were administered when two blood lead levels were more than 50 micrograms, or calcium disodium edetate (EDTA) provocative test yielded over 1000 micrograms/l of lead in the urine in the succeeding 8 hr. Therapy was on an ambulatory basis, but patients with moderate encephalopathy were hospitalized. Intramuscular EDTA, oral penicillamine, or the two drugs in sequence were given to 582 patients in 1967 and to 573 patients in 1968. Clinical evidence of lead intoxication was present in 103 or 8.9% of the 1155 patients. Several drug reactions to penicillamine were observed, but none to EDTA. Mortality dropped due to early detection and detoxification of subclinical cases of lead poisoning. (Author abstract modified)

23816 APTIC NO. 42397

Schlipkoeter, Hans-Werner

CONCLUSIONS. *(Schlussbemerkungen). Text in German. Staub, Reinhaltung Luft, 32(4):193-194, April 1972. (Presented at the VDI (Verein Deutscher Ingenieure) Clean Air Maintenance Committee, Carbon Monoxide Symposium, Duesseldorf, West Germany, Oct. 28-29, 1971.)*

Results presented at the Carbon Monoxide Symposium are reviewed and general conclusions are drawn. The results indicate that the effect of carbon monoxide is not simply due to oxygen deficiency, and that the inhibition of tissue enzyme activity is probable. The CO effects are best evaluated from the blood carboxyhemoglobin content which is dependent on concentration, exposure time, tidal volume, and barometric pressure. The central nervous system and the cardiovascular system were the main targets of CO. Reduced oxygen partial pressure in cat brains due to 100 ppm and impaired learning ability in rats were observed. Reduced vigilance of people exposed to a CO concentration corresponding to 5% COHb was determined. The effect of CO in concentrations corresponding to 5% COHb was detected. Impaired myocardial function with 5-9% of COHb was observed. Influence of CO on the decomposition of benzo(a)pyrene in the lung was determined, while cumulative effects are a possibility. Maximum allowable concentrations should be determined on the basis of the above investigations, in introducing an appropriate safety factor. Applying a safety factor of five would result in values of 6 ppm (8-hour mean) and 30 ppm (1-hour mean) as maximum allowable concentrations.

23817 APTIC NO. 42885

Semenova, V. N., S. S. Kazanina, and B. Ya. Ekshtat

THE TOXIC CHARACTERISTICS OF ETHYLENE CHLOROHYDRIN IN THE AIR OF WORKING PREMISES. *(K toksikologicheskoy kharakteristike etilenkhlorgidrina v vozdukhe rabochikh pomeshcheniy). Text in Russian. Gigiena i Sanit., 36(6):37-40, June 1971. 4 refs.*

The toxic properties of ethylene chlorohydrin were examined in a series of acute and chronic exposure experiments with laboratory animals. The upper parameters of its toxicity and the maximum allowable concentration, i.e., threshold value, for a single administration were determined. The effect of ethylene chlorohydrin on various functions and systems of the body and on the hereditary structure of bone marrow cells was investigated. Like most chlorinated hydrocarbons, ethylene chlorohydrin is a hepatropic poison causing chemotoxic lesions in the liver and affecting the central nervous system.

23818 APTIC NO. 42391

Sherwin, Russell P. and Valda Richters

THE RESPONSE OF LACTATE DEHYDROGENASE POSITIVE TYPE II PNEUMOCYTE TO AIR POLLUTANTS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 191-195. 10 refs. (Dec. 6-11, Paper MB 15C.)*

Two independent investigations were carried out, one with 43 guinea pigs where 22 were exposed to 0.5 ppm of sulfur dioxide and the other with 39 guinea pigs where 20 were exposed to a combination of 2-4 ppm of nitrogen dioxide and 5 ppm SO2. Frozen sections of the right upper and left lower lobes of each animal were examined for the number of lactate dehydrogenase positive alveolar wall cells and the number of alveoli in several areas of each lobe, using an eyepiece grid for delineation. The index of cell to alveolus was obtained for each area and the medians of each lobe of each animal compared. In the SO2 experiment, a total of 20,271 lactate dehydrogenase positive cells were counted in the right upper lobe of all animals with a total of 8655 alveoli. The figures corresponding to the left lower lobe of the SO2 experiment and the right upper lobe and the left lower lobe of the combined gas exposure are: 18,218 cells and 8260 alveoli; 16,733 cells and 6784 alveoli; 12,908 cells and 6093 alveoli. The most outstanding finding was a predominance of the indices for the right upper lobe over the left lower lobe of the same animal. No statistically significant differences were detected between the right upper lobe or left lower lobe of control and exposed animals in either the SO2 or combined gas exposures. However, a progressive increase in both control and exposed animal indices for both lobes was suggested from the data as the experiment continued, possibly due to ambient air pollution not filtered out or to other adverse influences on the lung. (Author conclusions modified)

23819 APTIC NO. 42325

Sidorov, K. K.

ASSESSMENT OF THE CUMULATIVE EFFECTS OF CHEMICAL COMPOUNDS IN DiFFERENT INHALATION REGIMES. *(Otsenka kumulyativnogo effekta khimicheskikh soyedineniy pri razlichnykh rezhimakh ingalyatsionnogo vozdeystviya). Text in Russian. Gigiena i Sanit., 37(5):93-95, 1972. 5 refs.*

Problems of the quantitative assessment of the cumulative effects of chemical compounds in different inhalation regimes are outlined. Comparisons of the cumulative effect should be based on the zone of biological action which is determined from the ratio of the single LD50 concentration to the threshold concentration applied under chronic exposure conditions. The broader the zone of the biological action, the more pronounced are the cumulative properties. The single LD50 concentrations are determined from a single exposure over 2-4 hours, followed by an observation period of 14 days. The zone of the biological action is assumed to be subject to normal distribution. Cumulation classes of compounds with the lowest and highest cumulative effects should contain largely the same number of compounds for test purposes. Three compounds with negligible cumulative effect (nitrogen dioxide, sulfuric acid, and ozone), 24 substances with moderate, 20 with pronounced, and two with strong cumulative effect were studied in round-the-clock inhalation tests. The same substances tested in permanent exposure over two to three months had wider zone of biological action due to intensified cumulative effect than in periodic tests where daily 4-hour exposures extended over 4 months were applied. The zone of the biological action in the former case was on an average fifty times as large as in periodic tests. Correlation between the magnitudes of the biological action range of toxic substances in industrial and natural atmospheres was established, and the same substances, when tested in the two different types of atmosphere, pertained to the same cumulation class in most cases.

23820 APTIC NO. 43431

Slingerland, D. Ward

THE INFLUENCE OF VARIOUS FACTORS ON THE UPTAKE OF IODINE BY THE THYROID. *J. Clin. Endocrinol., vol. 15:131-141, Jan. 1955. 14 refs. (Presented at the Annual Meeting of the American Goiter Assoc., Boston, Mass., April 29-May 1, 1954.)*

The iodide concentration gradient and QO2 (respiration) have been determined in fresh sheep thyroid slices. Aerobic conditions were necessary for iodide concentration. Extremes of temperature and pH diminished the ability of the thyroid slice to accumulate iodide. Many compounds which react with sulfhydryl groups were found to diminish the iodide gradient. An inhibitor of iodide uptake may or may not empty out iodide already concentrated. Compounds which depress the iodide-concentrating capacity do not necessarily depress the respiration of the slice, though most of them do. A factor which increases slice respiration may increase the iodide concentration but no substance has been found to depress respiration without also depressing the iodide-concentrating mechanism. (Author summary modified)

23821 APTIC NO. 43683

Steiner, P. E.

CANCER: RACE AND GEOGRAPHY. CHAPTERS 2, 7, AND 21. *Baltimore, William R. Wilkins Co., 1954, p. 9-23, 105-118, 265-310.*

Data from 35,293 necropsies performed at the Los Angeles County Hospital from 1918-1947 were analyzed to determine the frequency of cancer among three racial stocks: Caucasoids, Negroids, and Mongoloids. The necropsy examinations and tumor nomenclature were made according to modern standards. Comparisons of the tumors in the study population with those recorded in the literature were made for Caucasoids, Mexicans, blacks, Japanese, Chinese, and Filipinos. No significant difference in frequency of carcinoma of the lung was found between these racial groups in the Los Angeles data, except that Mexican females had a frequency about twice that of Caucasoid females. Frequency of lung cancer was greater in the Afro-American than in the African Negroid. Present evidence suggests that the predominant etiological factors in human lung cancer are environmental, but the possibility of inherent differences in cell susceptibility cannot be excluded. In Los Angeles, carcinoma of the larynx was as frequent in Mexicans as in Caucasoids, as common in Mexican females as in males, and much more frequent in Mexican than in Caucasoid females. In the Negroids, the frequency was probably lower than in Caucasoids; in Japanese, Chinese, and Filipinos the data were inconclusive. In Japan, laryngeal cancer appears to have about the same frequency ralative to other cancers that it has in the United States; in China, Mexico, the Philippines, and in Afro-Americans it appears to be less frequent. Laryngeal and lung cancer frequencies often show geographical and ethnic parallels that are best explained by environmental factors. Nasopharyngeal and cervical lymph node cancers have an extraordinarily high frequency relative to other tumors in China. The nasopharyngeal cancer is seen commonly also in Chinese in Cuba and in San Francisco. An etiological role for soot has been suggested for the nasopharyngeal cancer.

23822 APTIC NO. 42335

Suzuki, Masakuni, and Norio Murai

POLLUTION DISEASES OF FETUS. *(Taiji kogaibyo). Text in Japanese. Sanfujinka no Jissai (J. Gynecol. Practice), 20(10):951-958, Oct. 1971. 61 refs.*

The effects of public nuisances, including air pollution and other environmental pollutions, on the fetus are discussed. The primary air pollutants include sulfur oxides, nitrogen oxides, halogen compounds, particulates, carbon monoxide, and carbon dioxide; the secondary pollutants are oxidants, aldehydes, peroxyacylnitrate, and acrolein. These air pollutants cause chronic bronchitis, lung cancer, asthma, and other lung and heart diseases in adults; the effects on the fetus are awaiting study. The effects of various pollutants in water on the fetus are also not clear. Accidents, which occured at an industrial area in southern Japan due to the organomercury compounds discharged from an acetaldehyde manufacturer, have been thoroughly studied, and damages to the fetal brain and other organs are confirmed.

23823 APTIC NO. 42992

Tatarskaya, A. A.

OCCUPATIONAL CANCER OF THE UPPER RESPIRATORY PASSAGES IN THE NICKEL INDUSTRY. *(K voprosu o professional nom rake verkhnikh dykhatel nykh putey na proizvodstavakh polucheniya nikelya). Gigiena Truda i Prof. Zabolevaniya, vol. 9:22, 1965. 19 refs. Translated from Russian. Leo Kanner Assoc., Redwood City, Calif., 10p.*

Previous efforts to identify carcinogenic substances used in the carboxyl method of nickel refining are reviewed. Some authors consider that nickel carbonyl is capable of causing cancer, while others believe that arsenic may be the causative agent. Two case histories are presented of patients with cancers in the eye and nose region which developed after some years of working in electrolytic nickel refining shops. In the first case, in spite of constant observation by doctors, the malignant neoplasm was not diagnosed and deadlines for an operation were let pass. Histologic analyses gave no indication of malignant neoplasm. The tumor grew vigorously after polypotomy. In the second case, the tumor developed without symptoms and was discovered only when there were destructive changes. The presence of a fistular passage that had stimulated a boil led to incorrect treatment. Workers in electrolytic refining shops should be examined annually by an otolaryngologist. Several other measures are also recommended to aid in the diagnosis of malignant growths.

23824 APTIC NO. 43315

Tsujioka, Yoshitaka

EFFECT OF REPEATED EXPOSURE TO CIGARETTE SMOKE AND DUST IN LONG TERM ON CILIARY ACTIVITY. *(shigaretto-en, jinhai no choki hampuku bakuro no Kidosenmo-undo ni oyobosu eikyo). Text in Japanese. Nagoya Shiritsu Daigaku Igakkai Zasshi (J. Nagoya City Univ. Med. Assoc.), 22(4):573-598, Feb. 1972. 53 refs.*

Fifty-six rabbits were divided into a control group composed of eight rabbits and three exposure groups composed of 16 rabbits each. One exposure group was exposed once to dust of a mean concentration of 3025 mg/cu m for 25 min, 30 min after exposure to cigarette smoke for 25 min, one group was exposed twice, and one group three times. Their body weights and blood qualities were observed for eight weeks when each exposure condition was repeated once a day and the results were compared. In the experimental groups, the trachea was encleated from each of four rabbits selected at random from each group and the effect of exposure on the speed of discharging dust by the trachea was examined. The effect of exposure was hardly recognized in the group exposed once, but the speed of discharging dust decreased in the other exposed rabbits. The body weight increased in the first group almost in the same way as the control, but in the other groups it decreased a little until one week afterward, and then it increased. The carboxyhemoglobin in the blood of experimental groups increased rapidly until 2 weeks afterwards, but thereafter decreased gradually. The more exposure times increased, the more remarkably the CO-Hb amount increased, and the decrease of the CO-Hb amount was delayed. The red blood cell count and the hemoglobin amount in the first group increased in the same way as the control until 2 weeks afterwards. It decreased in the other two groups. The total amount of serum protein of the first group increased following the control, and increased a little in the second group, and decreased in the third group. The white blood cell count in the control did not show any variation, but it increased in experimental groups until 1 or 2 weeks afterwards, and thereafter decreased. The speed of discharging dust by the trachea was inversely proportional to CO-Hb amount, and was directly proportional to the red blood cell count, hemoglobin amount, Ht value, and total amount of serum protein. These were thought to be caused by the degree of exhaustion due to repeated exposure to cigarette smoke and dust.

23825 APTIC NO. 43458

Turrian, H., E. Grandjean, and V. Turrian

INDUSTRIAL HYGIENE AND MEDICAL STUDIES IN MERCURY PLANTS. *(Industriehygienische und medizinische Untersuchungen in Quecksilberbetrieben). Schweiz. Med. Wochenschr., 86(38): 1091-1096, 1956. 9 refs. Translated from German. 26p.*

In a rectifier plant, a thermometer plant, and a chemical plant, the mean concentrations of mercury in the air at various work places were determined. At the same time, the health of 58 mercury workers was studied, including mercury analyses of blood and urine. Investigations of the work sites showed that the mercury content of the air varies considerably. The actual ventilating conditions, the amount of mercury impurities on the ground floor, and proper manipulation are the determining factors. The mean mercury concentrations in the air were 10 60 micrograms/cu m in one part and 50-230 micrograms/cu m in the rectifier filling area of the rectifier plant, 300-600 in the thermometer plant, and 300-1000 in the chemical plant. The urine and blood analyses of mercury showed no satisfactory correlation either to the mean exposure to mercury vapors or to the clinical symptoms. These analyses cannot be used for the evaluation of the exposure or of the health condition of a mercury worker. Nevertheless, 15 of 58 workers studied had characteristic symptoms of chronic mercury poisoning such as tremor, gingivitis, poor dentition or dentures and subjective complaints of nervous disturbances and autonomic disorders. The frequency of these symptoms showed a significant correlation to the degree of exposure. Many workers had a tendency to hyperchromic anemia, which was more frequent among the more exposed workers. (Author abstract modified)

23826 APTIC NO. 43133

Ulmer, W. T., G. Reichel, A. Czeike, and A. Leuschner

REGIONAL INCIDENCE OF UNSPECIFIC RESPIRATORY TRACT DISEASES. *(Regionale Haeufigkeit unspezifischer Atemwegserkrankungen). Int. Arch. Arbeitsmed., vol. 27:73-109, 1970. 60 refs. Translated from German. Scientific Translation Service Inc., Santa Barbara, Calif., 39p.*

An epidemiological study was conducted in 1962-1968 among men and women in the Duisburg, Bocholt, and Borken districts of Germany. Subjective symptoms of bronchitis, e.g., cough, sputum, dyspnoea, and other catarrhal related symptoms, were compared to demonstrate that air pollution in the Ruhr area could not be correlated with nonspecific respiratory diseases when the age and smoking habits of the subjects were considered. Airway resistance, in fact, was lower in the industrial areas than in the rural areas. The incidence of bronchitic symptoms was exceptionally high at 25-81%. (Author abstract modified)

23827 APTIC NO. 43636

Voisin, C.

ETIOLOGIC FACTORS IN CHRONIC BRONCHITIS AND PULMONARY EMPHYSEMA. *(Les facteurs etiologiques dans la bronchite chronique et l'emphyseme pulmonaire). Text in French. Rev. Med. (Tirgu-Mures), 11(37):2175-2176, 2178-2179, Oct. 1970.*

Exogeneous and endogenous factors in chronic bronchitis and pulmonary emphysema are reviewed. Several factors overlap in their actions which makes it difficult to assess their respective contributions. Air pollution, primarily due to dust, soot, sulfur dioxide, nitrogen oxides, fluorine compounds, and oxidants, as well as smoking, particularly nicotinism, are the most important exogenous factors in chronic bronchitis and emphysema, while air pollution in occupational environment plays a minor role. Air pollutants cause irritation and hypersecretion of the mucous membranes, and reduce the resistance against microbial attacks. These exogenous factors are all the more dangerous when they combine with endogenous factors having produced constitutional predisposition. Such endogenous factors are age and sex, infections of the respiratory tract, allergies, genetic factors, hereditary immunity deficiency, mucoviscidosis, or alpha-l- antitrypsin deficit. The frequency of both chronic bronchitis and emphysema, higher for males than for females, increased with age. Infections of the respiratory tract facilitate the germination of germs in the subglottic tract, and the extension of lesions to the bronchioles or the parenchyma. Asthma is accompanied by bronchial hypersecretion in several cases, which may result in the combination of asthma with chronic bronchitis. Diverse genetic affections are accompanied by bronchial hypersecretion of chronic infection of the bronchi, or, less often, by emphysema.

23828 APTIC NO. 42900

Wagner, Peter D., Robert W. Mazzone, and John B. West

DIFFUSING CAPACITY AND ANATOMIC DEAD SPACE FOR CARBON MONOXIDE (C180). *J. Appl. Physiol., 31(6):847-852, Dec. 1971. 12 refs.*

The application of the mass spectrometer to measuring single-breath diffusing capacity of the lungs for carbon monoxide (DCO) was validated in examinations of anatomic dead space measured and compared both with and without breath holding with that of argon. Carbon monoxide labeled with the stable isotope 18-0 was used. The mass resolution, signal-to-noise ratio, linearity, and background of the instrument were adequate. Unless the mean alveolar volume during breath holding is used in the calculation, the value for DCO obtained depends on the portion of the alveolar sample analyzed. The anatomic dead space for CO was almost the same as that for argon, suggesting that the diffusion rate at the dead space-alveolar gas interface was not greatly affected by the alveolar concentration of the gas. (Author abstract modified)

23829 APTIC NO. 43150

Wyers, H.

SOME TOXIC EFFECTS OF VANADIUM PENTOXIDE. *Brit. J. Ind. Med. (London), vol. 3:177-182, 1946. 15 refs.*

An industrial disease is described with the unusual combination of dust reticulation and systemic intoxication. The observed features of the syndrome associated with industrial exposure to vanadium pentoxide are: pallor of the skin, greenish-black discoloration of the tongue, paroxysmal cough, rarely with hemoptysis, dyspnoea, pains in the chests, palpitation on exertion, tremor of the fingers and arms, barrel-shaped, emphysematous chest, profuse bronchitis, bronchospasm, raised blood prussure, accentuated pulmonary second sound, and reticulation on X-ray examination. It seems likely that colds and pneumonia are of more frequent occurrence than in the general population. Ten case histories are presented in brief. The chemistry, manufacture, pharmacology, and incidents of industrial poisoning from the metal are described. (Author summary modified)

23830 APTIC NO. 42957

Xintaras, C., M. F. Sobecki, and C. E. Ulrich

SLEEP CHANGES IN RAPID-EYE-MOVEMENT PHASE IN CHRONIC LEAD ABSORPTION. *Toxicol. Appl. Pharmacol., vol. 10:384, 1967.*

An abstract is given of research on the effect of chronic lead absorption on the electroencephalogram (EEG) record. Male rats were implanted with cortical reading electrodes and placed in electrically shielded chambers. Water containing lead acetate (1.5 mg/kg) was available ad libitum. To relate changes in the EEG record with behavioral changes, rat behavior, e.g., alert wakefulness and quiet sleep, was observed via a closed-circuit TV system. In the transition from wakefulness to sleep, the normal adult rat exhibited a typical succession of EEG changes similar to those found in man. The rapid-eye-movement (REM) sleep phase, a period of intense central nervous system activity, was entered by way of 15-cycle-per-second sleep spindles and was characterized by regular waves of 6 to 10 cycles per second. REM epochs were more abundant during the later part of the sleep record, i.e., late afternoon. Lead acetate induced changes in the duration and stability of the REM periods. Excessive spindle-slow-wave complexe appeared during periods of REM sleep. Treated animals showed more REM sleep during the early sleep periods compared to controls. These findings suggest that alterations in the REM phase in lead treated animals may be directly or indirectly associated with an impaired neural control system. (Author abstract modified)

23831 APTIC NO. 42973

Yoshimura, Takesumi

EPIDEMIOLOGICAL ANALYSIS OF YUSHO PATIENTS WITH SPECIAL REFERENCE TO SEX, AGE CLINICAL GRADES, AND OIL CONSUMPTION. *(Yusho ni okeru jushodo no kaiseki narabi ni sesshu yuryo chosa). Fukuoka Igaki Zasshi (Fukuoka Acta Med.), 62(1):104-108, 1971. 12 refs. Translated from Japanese. Leo Kanner Assoc., Redwood City, Calif., 15p.*

An epidemiologic analysis was made of 421 patients with Yusho (chlorobiphenyl poisoning) with regard to sex, age, and clinical grade. A total of 146 persons who consumed the canned rice oil contaminated with chlorobiphenyls were also examined to determine any relationship between the amount of rice oil consumed and their clinical grade, and to estimate the amount of chlorobiphenyls ingested. No difference was found between male and female patients with regard to clinical grade. The clinical grades were not uniform for all age groups; most cases were mild in ages 0-12, while most were serious for ages 13-29. A definite dose-effect relationship was noted between the amount of rice oil consumed and the clinical grades of the patients. The average amount of chlorobiphenyls ingested was estimated to be about 2 g per patient. (Author abstract modified)

23832 APTIC NO. 43168

Yoshimura, T.

A STUDY OF GROWTH IN JUVENILES AND STUDENTS WITH OIL DISEASE. *(Yusho jido, seito no hatsuiku chosa). Fukuoka Igaki Zasshi (Fukuoka Acta Med.), 62(1):109-116, 1971. 9 refs. Translated from Japanese by Translation Consultants, Ltd., Arlington, Va.*

School children with Yusho, chlorinated biphenyl poisoning, were compared with their matched control groups of healthy children in height and body weight for 1967, 1968, and 1969. The gain in height or in body weight which each sick child had before the poisoning from 1967 to 1968 and thereafter from 1968 to 1969 was compared with the distribution of the corresponding gains seen in his or her control group. Height and body weight gain of the boys with Yusho significantly decreased after the poisoning. This statistical analysis could not be applied to the girls, because it was not shown in their control groups that the gain before the poisoning is independent of that after the poisoning. But 16 of 19 cases after the poisoning showed a smaller gain than the average noted for the control groups. No certain relationship could be found between the clinical severity of the cases and their decrease of gain, because of the small number of cases available for the analysis. It is not known whether the noted disturbance in growth was caused primarily by the chlorobiphenyls poisoning or not. Additional studies, particularly a more detailed examination on the endocrine systems of the children and a further follow-up survey on their growth, seem to be necessary for the precise evaluation of the present findings. (Author summary modified)

23833 APTIC NO. 43527

Yunusova, Kh. K. and S. K. Khanafeyeva

CASES OF ACUTE INTOXICATION BY SEWER GASES. *(Sluchai tyazhelogo otravleniya kanalizatsionnymi gazami). Gigiena Truda i Prof. Zabolevaniya, 13(9):46-47, 1969.*

169<

Translated from Russian. Leo Kanner Assoc., Redwood City, Calif., 4p.

Two chemical plant workers were intoxicated with sewer gases containing hydrogen arsenide. Symptoms included hematologic and liver effects. Sewer lines in the plant shop of the workers were found to be missing hydraulic traps, and zinc dust and arsenic were periodically being dumped into the sewer connections. Work activities close to the shop floor, where sewer gas concentration was highest, led to the intoxication of the two workers. (Author abstract modified)

23834 APTIC NO. 43213

Zollinger, Hans U.

RENAL ADENOMAS AND CANCERS IN RATS CAUSED BY CHRONIC INTOXICATION WITH LEAD AND THEIR RELATIONSHIP WITH CORRESPONDING NEOPLASMS IN HUMANS. *(Durch chronische Bleivergiftung erzeugte Nierenadenome und -carcinome bei Ratten und ihre Beziehungen zu den entsprechenden Neubildungen des Menschen). Text in German. Virchows Arch., vol. 323:694-710, 1953. 24 refs.*

The weekly subcutaneous application of 20 mg lead phosphate (total dosage 40-760 mg) for 10 mo induced adenomas, papillomas, and cystadenomas of the adrenal cortex in 21 out of 112 surviving rats. Three animals developed cancers, two of which formed metastases in the renal pelvis. The cancers were caused in one animal by 300 mg, in two animals by 680 mg lead compounds. Earliest tumor development occurred 4 mo following the start of the experiment, induced by a dose of only 120 mg lead acetate. Histologic examination of the lead-induced neoplasms identified cysts as manifestations of the intoxication in the early stages, and typical and hyperplastic tubular epithelium in the later stages. All evidence indicates that lead directly affects nuclear metabolism and inhibits mitosis. Lead causes renal lesions by its radiomimetic action followed by hyperplastic growth. Tumorigenesis is probably accompanied by regenerative processes following the destruction of the epithelium, but these processes in rats are far less pronounced than in the case of renal lesions induced during human tumorigenesis. Hormonal stimulatory hyperplasia can be excluded as the cause of the neoplasms. No similarity between the renal tumors examined and hypernephromas was observed.

23835 APTIC NO. 42414

Zorn, Hans

THE PARTIAL PRESSURE OF OXYGEN OCCURRING IN BRAIN AND LIVER TISSUES UNDER CONDITIONS OF SUBTOXIC CARBON MONOXIDE CONCENTRATIONS. *(Der Sauerstoff-Partialdruck im Hirngewebe und in der Leber bei subtoxischen Kohlenmonoxid-Konzentrationen). Text in German. Staub, Reinhaltung Luft, 32(4):151-155, April 1972. 13 refs.*

The effect of moderate carbon monoxide concentrations on the oxygen partial pressure on the surfaces of brain and liver as well as in the cerebral tissues of rats, rabbits, and cats was studied using platinum electrodes. The measurements substantiated a distinct inverse relation between the oxygen tension and the carboxyhemoglobin values between 3 and 30%. Even low CO concentrations under adverse conditions may lead to crucial oxygen partial pressure values in tissue.

EFFECTS-PLANTS AND LIVESTOCK

23836 APTIC NO. 42923

EFFECT OF AIR POLLUTION ON VEGETATION. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 5, p. 49-61. 18 refs.*

Local meteorology, industrial operations, type of fuel in general use, incinerator practice, motor fuel consumption, and other factors all contribute to the individual character and extent of the pollution produced and the resulting damage to vegetation. Gas exchange by the plant takes place largely by diffusion through the many breathing pores or stomata, thereby permitting the entry of gaseous phytotoxicants into the leaf. Light, temperature, humidity, soil moisture, fertility conditions, and stage of growth all play a part in controlling gas absorption by the plant. Plant injury due to sulfur dioxide, fluorides, oxidants, chlorine, hydrogen sulfide, ammonia, mercury vapor, and ethylene are considered. The use of plants in measuring and evaluating air contaminants is discussed, as well as the inspection of plants in making a field survey.

23837 APTIC NO. 42924

EFFECT OF AIR POLLUTION ON FARM ANIMALS. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 6, p. 63-71. 97 refs.*

The susceptibility of animal species to air pollutants will vary according to the specific contaminant in question. In addition to different species susceptibilities, individual animal variations also exist within each species. The lesions produced by air pollutants depend on the toxic property of the pollutants, the dosage rate, the duration of the exposure, and the susceptibility of the animal. Criteria are listed for the diagnosis of injury by air pollutants. It is important in investigating the effects of air pollutants on farm animals to ascertain whether any abnormal condition found is the result of the pollutants in question or some other stress. Nutritional disorders, metabolic diseases, mineral deficiencies, and accidental poisoning are considered. Adequate information is needed on the dosage range of the contaminants to which the animals are subjected, and a careful meteorological study of the area should be included. Tissue samples may provide an important source of data when animal injury has resulted from specific known pollutants. The effects of arsenic, fluorides, lead, molybdenum, and sulfur dioxide on farm animals are discussed, including threshold limit values and toxic tolerances.

23838 APTIC NO. 43226

Aschbacher, P. W.

AIR POLLUTION RESEARCH NEEDS WITH ANIMALS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 31p., 1972. 107 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami Beach, Fla., June 18-22, 1972, Paper 72-153.)*

Based on published reports, air pollution problems relating to livestock are identified. These are discussed under two categories: pollutants from industrial-urban sources affecting livestock, and pollutants originating from animal production units. The available knowledge concerning these problems is briefly described. Air pollution from industrial sources affecting farm livestock is usually the result of accumulation of the pollutant on forage in a localized area surrounding the source, and the animals affected are primarily herbivores. Specific pollutants discussed in this regard are fluorine, lead, molybdenum, cadmium, and arsenic. In the second category, available information on specific pollutants identified as arising from various livestock production systems is presented. In any animal production system, volatile compounds from decomposing manure may be released into the atmosphere. In some cases, these gases may have adverse effects on the animals in the housing unit, or they may possess such odors as to be considered a public nuisance. Gases present in poultry, swine, and cattle housing units are identified. Of all problems identified, extensive information is available only for fluorosis, and in all cases the knowledge to assess the situation completely is lacking. (Author abstract modified)

23839 APTIC NO. 43490

Berge, Helmut

INJURY TO FRUIT AND FOREST TREES FROM SULFUR DIOXIDE EMISSIONS. *(Durch Schwefeldioxyd bedingte Immissionschaeden an Obst- und Waldbaeumen). Gartenbauwissenschaft, 24(2):220-228, 1959. 17 refs. Translated from German. 12p.*

Observations and sulfur dioxide emission-control tests in the northeastern industrial area of North Rhine-Westphalia showed that under certain conditions plant analysis provides important evidence in diagnosing smoke damage. The threshold values for SO2 noxiousness claimed by some authors can only be applied on such a wide range that their usefulness is questionable. Schedules covering the sensitivity of plants are only of local and temporary value, due to the effects of ecological and meteorological conditions and species variation. Differences in the sensitivity of species and varieties of fruit and forest trees are discussed. A number of examples show that parasitic attack or diseases increase SO2 absorption and/or symptoms of smoke damage. For several tree species, including apple, pear, plum, scotch pine, mountain ash, and beech, the seasonal total content of sulfur (expressed as SO2) in the foliage is shown in curves, which are in good agreement with an earlier study.

23840 APTIC NO. 42974

Comeau, G. and F. LeBlanc

THE INFLUENCE OF OZONE AND SULPHUR DIOXIDE ON THE REGENERATION OF FUNARIA HYGROMETRICA HEDW. LEAVES. *(Influence de l ozone et de l anhydride sulfureux sur la regeneration des feuilles de Funaria hygrometrica HEDW). Natur. Can., vol. 98:347-358, 1971. 25 refs. Translated from French. Scientific Translation Service, Inc., Santa Barbara, alif., 13p.*

The regenerative power of Funaria hygrometrica leaves after exposure to various concentrations of sulfur dioxide and ozone for different lengths of time was studied. With O3 the percentage of regenerations is inversely proportional to the length of exposure and to the concentration for fumigations of 6 and 8 hr. With SO2 the percentage of regenerations is inversely proportional to the length of exposure and to the concentration for fumigations of 4, 6, and 8 hr. Ozone has a stimulating effect when administered for short periods. Leaves coming from the upper part of the stem have a higher percentage of regeneration than those of the lower part.

23841 APTIC NO. 42958

Daines, Robert H., Ida Leone, and Eileen Brennan

THE EFFECT OF FLUORINE ON PLANTS AS DETERMINED BY SOIL NUTRITION AND FUMIGATION STUDIES. *Interdepartmental Committee on Air Pollution, Washington, D. C., Air Pollut., Proc. U. S. Tech. Conf., Washington, D. C., 1950, p. 97-105. 4 refs. (May 3-5, Louis C. McCabe, ed.)*

Results of experimental studies of fluorine toxicity and mechanisms of action in various plant species are reported, indicating that plants absorb F from both the atmosphere and soil, thereby accumulating the abnormally high F content that causes development of typical toxic symptoms. A means of distinguishing between F from the air or from the substrate was determined, since atmospheric F results in a high leaf and low root F content, whereas soil F causes a high leaf and even higher root content. Plant species vary in their threshold concentrations that cause visible injury, in capacity for uptake of F, and in the relation between F content and the extent of injury. Plants grown with optimum supplies of nitrogen, calcium, and phosphorus are more susceptible to F injury from the soil and, to a less extent, from the atmosphere than plants with unbalanced nutrition. As the soil pH increases, F toxicity and the amount of F absorbed are minimized High atmospheric humidity, turbidity of the plant, and wetting of the plant surfaces are conducive to a greater degree of injury and F absorption. A loss of F in plant leaves following an exposure to F in solution or in the atmosphere is being studied. (Author conclusions modified)

23842 APTIC NO. 43456

Dopp, W.

THE ACTION OF SULFUROUS ACID ON FLOWERING ORGANS. *(Ueber die Wirkung der schwefligen saeure auf Bluetenorgane). Ber. Deut. Botan. Ges., vol. 49:172-221, 1931. 23 refs. Translated from German. 67p.*

For determining the influence of sulfur dioxide on pollen and pollen germination, experiments were carried out either in closed containers in which a definite concentration of SO2 had been established, or by a method in which a mixture of SO2 and air of the desired concentration was continually passed through a space in which the objects were located. Gasing of fresh, air-dry pollen resulted in damage illustrated by a total loss of the germinative power or a reduced percentage or retarded germination. The pollen from the gassed pollen grains frequently showed retarded growth, dependent on the atmospheric humidity content, when grown on 1.5% agar containing sucrose. Results from tests conducted on Lupinus luteus showed germination greatly reduced when the specimen was exposed to moist air, thus indicating that moist pollen was damaged much more than air-dry pollen. Tests of pollen on an artificial substrate exposed to a sufficient action of SO2 showed either germination was destroyed or the pollen tubes remained short, split open, and emptied their content when germination did occur. The material was much more sensitive in these experiments; concentrations of 1:1000 or 1:10,000 caused a loss of germinative power after 1 minute; harmful effects were noted in dilutions of up to 1:1,000,000; and, the harmful effect was greater with 1.5% agar than with 5% agar. Light did not influence the action of SO2 on the pollen and pollen tubes. Experiments with shoots that were flowering or about to flower showed damage to the plant manifested by having the opening of the flower, anther, or stigma retarded, by a reduction of the percent germination of the pollen taken from the gassed anthers, by having the number of pollen reduced which germinated on the stigma, and by shorter lengths of the pollen tubes in the style. Specific SO2 concentrations were not connected with visible damage to the tissues of the stigma, style, or and/or ovary. (Author conclusions modified)

23843 APTIC NO. 43622

Drinker, Phillip

AIR POLLUTION AND THE PUBLIC HEALTH. POLLUTION BY FLUORIDES. *Roy. Inst. Public Health Hyg. J. (London), vol. 20:307-316, Sept. 1957. 21 refs. (Presented at the Royal Institute of Public Health and Hygiene)*

The effects of sulfur dioxide, fluorides, ozone, and Los Angeles smog on plants are reviewed. The emissions of dusts, grit, and ash and their control by isolation are considered. The regulation of industrial and vehicular exhaust air pollution are presented. Fluoride contaminants mentioned are: hydrofluoric acid, silicon tetrafluoride, sodium fluoride, and calcium fluoride.

23844 APTIC NO. 43491

Eichorst, Erika and Kurt Garber

MICROSCOPIC AND MICROCHEMICAL STUDIES WITHIN THE FRAMEWORK OF SO2 SMOKE DAMAGE DIAGNOSIS. *(Mikroskopische und mikrochemische Untersuchungen im Rahmen der SO2-Raushechachendiagnostik). Mikroskopie, vol. 25:237-242, 1969. 13 refs. Translated from German. 9p.*

Corrosions on leaves caused by acid smoke of factories and the anatomical changes of cells are described. Corrosions

caused by soot and sulfuric acid in experiments are compared with corrosions observed in industrial areas. Application of the Bredemann and Radeloff method to detect sulfur dioxide in leaves by precipitation of barium sulfate demonstrated that SO2 is often present in leaves far away from factories, since air in wide areas contains SO2. Better results can be obtained by determining the content of sulfate in leaves. The results of the qualitative method agree with the results obtained by quantitative analysis of plant material. (Author summary)

23845 APTIC NO. 42994

Elrick, D. E., J. W. Biggar, and L. R. Webber

SOIL POLLUTANTS: THEIR ORIGIN AND BEHAVIOR. *J. Soil Water Conserv., vol. 21:7-11, Jan.-Feb. 1966. 26 refs.*

An airborne pollutant, washed out of the atmosphere by precipitation, may settle in particle form on the soil surface. The pollutant may subsequently percolate through the soil to ground water or stream supplies. Sources of soil contaminants are considered, and several of the research techniques being used in an attempt to understand their behavior in soils are outlined. Pesticides and other agricultural chemicals, sewage and industrial wastes, biological contamination, and radioactive contamination are considered. With a porous medium, the movement of chemical substances can take place by diffusion or convection in the liquid or vapor phases. Chemical reactions, such as adsorption, fixation, precipitation, and other soil interactions, and breakdown or decay of the chemicals, will influence the transport process in a variety of ways. Two mechanisms are responsible for the movement of chemical substances. One is a diffusive movement resulting from variations in concentration with position in the soil. Second, convection of water and/or soil air will drag the chemicals along with them. The reaction of a chemical substance which comes in contact with the soil can occur in a number of ways. The soil as a chromatographic column presents the most obvious approach to some of these pollution problems. A knowledge of the soil water and ground water movement is necessary to predict the behavior of contaminated zones.

23846 APTIC NO. 43281

Faller, N.

PLANT NUTRIENT SULPHUR-SO2 VS. SO4. *Sulphur Inst. J., 7(2):5-6, Summer 1971. 3 refs.*

Although it was demonstrated that atmospheric sulfur dioxide is an alternative source of plant nutrient sulfur, it was not determined how this source compares in relative efficiency with sulfate uptake through the roots. To compare the two sulfur sources, a series of experiments was carried out with tobacco plants. The yield obtained with SO2 as the only source of sulfur clearly indicates that this is a completely satisfactory way of supplying sulfur. The combination of atmospheric SO2 and root sulfate reduced the root yield slightly compared with the straight root sulfate treatment. However, the leaf and stem yield showed an increase, except for the highest sulfate concentration. The plants had been grown in nutrient solutions containing 0, 40, 80, and 240 ppm sulfur as sulfate. One set of test plants was transferred to closed glass cages, in which they were subjected to 1.5 mg SO2/cu m of air. Before transfer to the glass cages, the young plants grown in the control solution showed sulfur deficiency symptoms in the form of chlorotic leaves. When sulfur dioxide exposure was started, these symptoms disappeared in the first few days.

23847 APTIC NO. 43492

Garber, K.

STUDIES AND EVALUATION OF SMOKE DAMAGES. *(Untersuchung und Begutachtung von Rauchschaeden). Jahresber. Staatinst. Angew. Bot., Hamburg, vol. 76/78:119-127, 1961. 13 refs. Translated from German. 12p.*

A summary is presented of 666 studies and evaluations conducted in the field of smoke damage to vegetables, ornamental plants, fruit and other trees, and bushes. A large number of plants are categorized based on their individual sensitivity to hydrofluoric acid and sulfur dioxide gases. Depending on their chemical composition, dusts can have damaging effects on both plants and soil fertility. The calcium oxide content in soil in the vicinity of a cement plant was studied. Plant damage is traced to chlorine- containing fumes in conjunction with amonia from a zinc extrusion plant and to sulfur-containing exhaust gases from warm slag used to repair sidewalks. High amounts of molybdenum in plants can be toxic to ruminants.

23848 APTIC NO. 43493

Garber, K.

STATE AND ATTAINMENT OF AGRICULTURAL CHEMICAL AND AGRICULTURAL BIOLOGICAL RESEARCH. *(Stand und Leistung agrikulturchemischer und agrabiologischer Forschung). Landwirtsch Forsch., no. 20:116-118, 1966. 6 refs. Translated from German. 5p.*

The increased fluorine content in plants in regions of fluorine emission was investigated to ascertain whether this increase might also be due to absorption from the soil. The fluorine content in different plant types in different soils, the effect of single or split application of fluorine on the growth and F content of plants and the extent of increased F content in the soil on plants was researched. The findings proved that the F content in plants does not run parallel to the natural F content of the soil. Fine, sandy, marshy and clay soils were tested. Bush beans were the experimental plants. (Author abstract modified)

23849 APTIC NO. 43342

Glater, Ruth Ann B. and Louis Hernandez, Jr.

LEAD DETECTION IN LIVING PLANT TISSUE USING A NEW HISTOCHEMICAL METHOD. *J. Air Pollution Control Assoc., 22(6):463-467, June 1972. 20 refs.*

A simple and rapid method for identifying and distinguishing lead from other heavy metals in living plants has been developed using sodium rhodizonate which forms a scarlet precipitate with lead at approximately pH 2.8. Hand sections of plant tissues are treated with rhodizonate reagent, buffered, and examined microscopically. Those cells and tissues contaminated with lead turn scarlet--color intensity being directly related to concentration. Lead may be detected in quite low concentrations (in the order of 10 ppm) and may be observed in situ; its entry and movement through plant can thus be followed. A disadvantage of the method is that the color does not persist beyond a few hours. In an area of moderate traffic of Downey, California (Southeast Los Angeles), lead was found abundantly on leaves as well as on roots of garden-grown lettuce; origin of this lead presumed to be from car exhausts. (Author abstract modified)

23850 APTIC NO. 42828

Grennard, Alf

SULFUR DIOXIDE - ACTIVE ENVIRONMENTAL PROTECTION OR POLITICAL TACTICS? (Svaveldioxid - aktiv miljovard eller politisk taktik)? Text in Swedish. Tek. Tidskr. no., 10:41-44, 1972.

The tendency to blame acidification of soil and water on sulfur dioxide emissions is criticized. Forest soils have pH values as low as 3.5-4. The sulfur deposition is 9 kg/ha yearly. However, no negative effects due to depositions of 100 kg of S/ha were determined. The estimated 0.4% growth reduction in forests, may be due to a great number of factors; no casuality between the former and SO2 has been demonstrated. The same applies to the acidification of lakes, where the assertions are based on measurements performed at a single lake over a one-year period. On the other hand, investigations revealed the need of certain soils and vegetation for sulfates and SO2. The situation in Sweden regarding air pollution due to SO2 is, moreover, better than in any other highly industrialized country. Thus, the measures taken to control SO2 emissions by reducing the sulfur content in oil were both immature and biased and could be of serious economic consequences. The forceful drive against SO2 may have served to divert attention from other environmental problems.

23851 APTIC NO. 43420

Guderian, R.

EFFECT OF NUTRIENT SUPPLY ON THE ABSORPTION OF SULFUR DIOXIDE FROM THE AIR AND ON PLANT SUSCEPTIBILITY. *(Einfluss der Naehrstoffversorgung auf die aufnahme von Schwefeldioxid aus der Luft und auf die Pflanzananfaelligkeit). Landesanstalt fuer Immission und Bodennutzungsschutz des Landes Nordrhein-West falen, Essen (Germany), 1970 Annual Report, no. 23, p. 51-57, 1971. 26 refs. Translated from German. Translation Consultants, Inc., Arlington, Va., 20p.*

The effect of various quantities of soil and differing treatments with nitrogen, phosphorus, potassium, and calcium on the susceptibility of plants to sulfur dioxide was studied. The degree of SO2 absorption was determined. Whereas the addition of nitrogen had differing effects on the level of natural sulfur content depending on the type of plant, specific tendencies were noted in the case of other nutrients. The sulfur content of plants increased with an increasing supply of calcium and phosphorus, while it became lower with potassium. Nitrogen fertilization was not uniform in its effect on SO2 absorption from the air. Depending on the soil and type of plant, the sulfur concentration was at times higher and at times lower than in the case of unfertilized plants. In general, nitrogen fertilization increased plant resistance to SO2. A compensated calcium-balance in the soil raised the resistance significantly, with only slight reductions in SO2 absorption. Potassium additions had no effect on SO2 absorption but did increase plant resistance. With increasing phosphorus additions, sulfur concentration and the extent of leaf damage increased. (Author summary modified)

23852 APTIC NO. 42946

Gyoerkoes, T. and J. M. Baretincic

DETERMINATION OF F IN VEGETATION WITH F SELECTIVE ION ELECTRODE. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers (AIME), New York, N. Y., p. 489-495, 1971. 1 ref. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 100th, New York, Feb. 26- March 4, 1971.)*

Preliminary work of the Boyce Thompson Institute was evaluated and some modifications were made. In the modified method, the fluorine is leached out of the ground vegetation using perchloric acid. The sample is then filtered and the filtrate is made up to 100 ml with a buffer containing sodium carbonate, sodium chloride, and sodium citrate. The sample solution should now have a pH of approximately 5.5 and is ready to be read after calibration of the meter with suitable standards. The results of electrode analysis (potentiometry) of 140 vegetation samples with values ranging from 3 to 500 ppm compared to automated analysis shows a correlation of 0.993 and the regression equation indicated a slope of 1 and an intercept of 1.7 ppm. The procedure as modified uses more HCl04 than does the Boyce Thompson method. Also, the application of a wetting agent to both the acid and buffer solutions gives better solution contact with the finely ground sample, yielding a more efficient extraction of fluoride.

23853 APTIC NO. 43225

Heck, W. W., O. C. Taylor, and H. E. Heggestad

AIR POLLUTION RESEARCH NEEDS FOR HERBACEOUS AND ORNAMENTAL PLANTS AND FOR AGRICULTURALLY GENERATED POLLUTANTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 34p., 1972. 68 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami Beach, Fla., June 18-22, 1972, Paper 72-154.)*

The effects of various air pollutants on economically important crops and ornamentals have been studied since before the turn of the century. Summaries of this effects research in Criteria Documents developed by the Environmental Protection Agency should be reviewed in light of differential regional sensitivity. These differences are associated with environmental parameters and the distribution of pollutants. Many research efforts on air pollution injury to vegetation have been poorly coordinated, leaving many knowledge gaps. A better assessment of the air pollution impact on vegetation is required to prompt realistic controls for pollutants affecting agriculture. Research areas of major concern include: baseline information on effects of pollutants on agricultural productivity; dose-response information to support predictive mathematical models for acute and chronic studies of growth, yield, and quality effects; effects of pollutants interacting with other pollutants and with insects and plant diseases; mechanisms of pollutant action; genetic changes related to pollutant effects; effects of environmental stresses on plant response to pollutants; evaluation of plants, including soil microbes, as pollutant sinks; development of techniques to minimize pollutant effects; and the effects of agricultural chemicals as air pollutants. There is a need for studies that consider the whole plant in its natural environment. Conceptual models, interrelating pollutant effects and their interactions, and, ultimately, mathematical models will be needed to develop an intelligent approach to land management. (Author abstract modified)

23854 APTIC NO. 43663

Jamrich, V.

IS CHLOROPHYLL STABILITY A FACTOR IN THE POWER OF RESISTANCE AGAINST FUMES? (Je stabilita chlorofylu faktorom odolnosti proti dymu?). Zbornik Vedeckych Prac Lesnickej Fakulty Vysokej Skoly Lexhickej a Drevarskij Vo Zvolene, vol 1:7-14, Oct. 1968. 14 refs. Translated from Czech. 14p.

The relationship between the intensity of the effects of gaseous fluorine compounds, in the form of industrial emissions, and the degree of chlorophyll destruction in two species of trees was studied. Alnus glutinosa was selected to represent the resistant species, and Quercus patraea to represent the species of low resistance. Each species was exposed to a definite amount of fluorine, and the degree of depigmentation was expressed in terms of the differences in the total chlorophyll and the differences found in the components, chlorophyll a and chlorophyll b. The degree of chlorophyll destruction is directly proportional to the intensity of exposure to fluorine; the degree of depigmentation is also dependent on the strength of the chlorophyll bonds in the plastid structures. Depigmentation is continuous with changes in the ratio of chlorophyll components, and chlorophyll b is relatively more stable than chlorophyll a. (Author summary modified)

23855 APTIC NO. 43455

Jancarik, Vlastislav

OCCURRENCE OF WOOD-DAMAGING FUNGI IN THE SMOKE DAMAGED KRUSNA HORA REGION. *(Vyskyt drevokaznych hub v kourem poskozovane oblasti Krusnych hor). Lesnictvi, 7(7):677-692, 1961. 14 refs. Translated from Czech. 27p.*

Studies were conducted in the Krusna Hora region during the fall of 1957, 1958, and 1960 and the spring of 1959 at the test sites of Vilejsov, Cervena Jama, and Mnisek to determine the main fungus diseases which contributed to the reduced quality and deterioration of the health of growths in this region damaged from smoke gases. The fungi, which caused the decay of standing trees, stumps, broken crowns, and remnants after the trees were felled or uprooted, were determined primarily by fecundity or by permanent determinable signs such as rhizomorphs or mycelium. Tests show that in spruce growths in the region the most important fungus diseases are red rot and in weaker trees, white rot. Results indicate that wood-damaging fungi are comparatively not as important as other harmful agents, since the contribution from fungus damage to economic losses is far less than that attributed to smoke exhalations and non-biotic factors. Fungi caused more damge on trees felled by smoke than by trees felled by other causes.

23856 APTIC NO. 42954

Knabe, W.

AIR POLLUTION - FOREST SITE FACTOR OR EVIL WHICH CAN BE KEPT OFF? - RECOMMENDATIONS FOR THE DETECTION AND CONTROL OF FUME DAMAGE IN A FOREST-RANGE. *Forstarchiv, 42(8/9):172-179, 1971. Translated from German. 29p.*

Ways in which the forest ranger can assess the effects of fumes on the forest trees are suggested. In judging these effects three cases must be distinguished: single sources, congested areas, and long-range effects. The plant damage that may result from each of these cases is described in detail. Three field methods to clarify suspicion of fume damage in a forest range are described. The first of these involves testing the needles of pine branches for the degree of needle foliage, degree of pollution, needle color, and distribution of damage to the needles. Evaluation of the lichen vegetation on tree bark can also provide information about fume damage. Lichens are killed off by very small concentrations of sulfur dioxide, hydrogen fluoride, and hydrochloric acid. The third field method involves determining the pH value of precipitation. The following values are given to aid in evaluating the pH readings: 2.0-3.0 - suspicion of strong effects from acid fumes; 3.1-4.0 - suspicion of slight effects from acid fumes; 4.1-6.0 - no indication for acid or alkaline fumes; 6.1-7.0 - suspicion of slight effects from alkaline fumes; and 7.0 suspicion of strong effects from alkaline fumes. It is noted, however, that the most reliable proof of fume damage is a matter of scientific investigation by trained experts.

23857 APTIC NO. 43129

Knabe, W.

AGRICULTURE AND FOREST MEASURES TO REDUCE DAMAGE FROM IMMISSION. *(Pflanzenbauliche Massnahmen zur Verminderung von Immissionsschaeden). Landwirt. Forsch. Sonderh., 26(1):41-54, 1971. 86 refs. Translated from German. Scientific Translation Service Inc., Santa Barbara, Calif., 21p.*

Measures for reducing damage to plants due to ground level emissions of pollutants from various industrial plants are considered. The measures chosen must necessarily depend on the region and the economy of the situation. Some measures might include a change of crop species; growing relatively resistant types; breeding emission-resistant plants; soil improvement, fertilization, and irrigation; protective plantings and development of emission-resistant stands; and plant protection measures, e.g., chemical agents. Emission regions, i.e., injury or danger zones, may be demarcated on the basis of vegetation surveys, symptom mapping, yield estimation, measuring grids with biological indicators, soil and water mapping, and emission concentration and rate determinations.

23858 APTIC NO. 43528

Knabe, Wilhelm

AIR POLLUTION AND FORESTRY. THE EFFECT UPON FORESTRY RESEARCH. *State Inst. for Immission Control and Soil Conservation, Essen (West Germany), (Luftveruneinigungen und Waldwirtschaft - Konsequenzen fuer die forstliche Forschung). 1972. 110 refs. Translated from German. 37p.*

Suggestions for future research on the relationship of air pollution and forestry are presented. Air pollution constitutes a significant location factor for forestry activities. References given include survey reports, conference minutes, manuals, and documentation for magazine articles. The status of research is described for certain fields. The spread of damage, diagnosis, determination of economic losses, measures to reduce damage demarcation of the emission area, air quality criteria, and damage mechanisms are discussed. Starting points for forestry research in the field of emission control are described. Topic-oriented research and development of new methods are needed. On the basis of the emission situation in North Rhine-Westphalia, it is obvious that a long-term solution of the problem is only possible if the rule of economic growth is replaced by a dynamic state of equilibrium. (Author summary modified)

23859 APTIC NO. 43375

Leone, Ida A. and Eileen Brennan

MODIFICATION OF SULFUR DIOXIDE INJURY TO TOBACCO AND TOMATO BY VARYING NITROGEN AND SULFUR NUTRITION. *J. Air Pollution Control Assoc., 22(7):544-547, July 1972. 16 refs. (Presented at the Air Pollution Control Association Annual Meeting, 64th, Atlantic City, N. J., June 1971, Paper 71-64.)*

Tobacco and tomato plants, grown in a sand solution culture with varying levels of nitrogen or sulfur, were exposed to injurious levels of sulfur dioxide. Plants of both species which were deficient in either nutrient showed decreased susceptibility to the gas compared with plants grown at optimal levels of each nutrient. Foliage of these plants was also found to have increased stomatal resistance, as measured by a porometer and decreased total sulfur accumulations. Plants grown at optimal levels of each nutrient showed increased susceptibility over that of the deficient plants. At the supra-optimal nitrogen and sulfur levels, there were differences in susceptibility. Overabundant nitrogen appeared to decrease susceptibility, whereas over-supplies of sulfur increased it. The response of plants with deficient or optimal supplies of either nutrient might be explained by the effects of nutrition on stomatal activity and hence on ability to absorb sulfur dioxide sulfur from the atmosphere. Mineral deficiency is known to increase stomatal resistance, and mineral sufficiency, to decrease stomatal resistance by virtue of increased efficiency of water use. The difference in response between plants overfertilized with respect to nitrogen or sulfur is explained by the fact that sulfur is both nutrient and phytotoxicant. Increased carbohydrate accumulation in the nitrogen and sulfur-deficient plants may play an additional role in protection from SO2 injury. (Author abstract modified)

23860 APTIC NO. 42336

Maeno, Michio

EFFECTS OF HEAVY METALS IN DUST ON TREES. *(Baijinchu no kinzoku seibun no jumoku e no eikyo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 8(6):535-542. June 1972.*

Metal contents in trees were investigated at two major cities of Kanagawa Prefecture. Iron was found in the largest concentration, followed by zinc, manganese, lead, copper, nickel, chromium, and cadmium. All the metal contents were higher in trees in industrial areas than in those in commercial and residential areas. The average metal content of particulates on the leaves of seven kinds of trees in a industrial area in Kawasaki City were 86.7 mg/sq m leaf area for Fe, 1.33 mg/sq m for Mn, 1.07 mg/sq m for Zn, 0.34 mg/sq m for Pb, 0.11 mg/sq m for Cu, 0.11 mg/sq m for Ni, and 0.004 mg/sq m for Cd. The average components of particulates on the leaves of trees in an industrial area were 38.1% silicon dioxide, 14.1% aluminum oxide, 18.3% ferric oxide, 7.2% calcium oxide, 1.8% magnesium oxide, and 9.6% sulfur trioxide, and those in a non-industrial area were 45.3%, 16.6%, 8.8%, 6.2%, 2.0%, and

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8.5%, respectively. Investigations on the growth of trees revealed that new leaves in industrial areas had smaller leave areas and poor growth conditions.

23861 APTIC NO. 42611

Nakashima, Yashuhiro, Yukihiro Hagihara, and Seiji Ogawa

STUDIES ON THE SMOKE DAMAGE OF TREE (2). ON THE ACUTE DAMAGE SYMPTOMS BY THE SO2. *(Jumoku no engai ni kansuru kenkyu (Dainiho) - SO2 ni yoru kyusei higai shojo ni tsuite). Text in Japanese. Fukuoka-ken Ringyo Shikenjo Jiho (Bull. Fukuoka-ken Forest Exp. Station), no. 22:1-28, March 1972. 15 refs.*

Acute sulfur dioxide symptoms in staple tree-planting species were examined. Experiment results on three species, Cryptomeria japonica, Pinus thunbergii, and Liquidamber styraciffua, concerning the effects of fertilizer on damage symptoms are also presented. Practical SO2 resistance power against chronic damage can be recognized from the results of acute damage. The appearance of SO2 acute damage was slow in plants using NPK manure and compost, and the damage was slight. In control plots, the damage appeared soon, with much leaf burn and leaf foll; the rate os semi-dead or dead trees was high. For the purpose of tree planting in air pollution regions, fertilization is indispensable as one means of searing healthy trees.

23862 APTIC NO. 42857

Nielsen, S. W.

ENVIRONMENTAL POLLUTANTS PATHOGENIC TO ANIMALS. *J. Am. Vet. Med. Assoc., 159(9):1103-1107, Nov. 1, 1971.*

Veterinary diagnostic laboratories have detected a number of disease problems caused by environmental pollution. The pollutants and the resulting disease conditions are in many forms. Air pollution due to industrial and automotive exhaust fumes causes damage to the lungs of man and lower animals that closely share his environment, namely, the dog and the cat. Lung lesions caused by prolonged fume or dust inhalation range from anthracosis, emphysema, and fibrosis to lung cancer. Dogs and cats in London have a much higher incidence of oro-pharyngeal cancers than in any other area in the world. Radioactive fallout from the testing of nuclear devices has caused chronic radiation dermatitis and precancerous lesions in cattle, mules, and other animals grazing near test sites. Fluorosis has been observed in cattle and deer on pastures surrounding factories processing clay or other raw products with high fluoride content. Other environmental pollutants which are toxic to animals include nerve gas, chlorinated hydrocarbons, polychlorinated biphenyls, lead, and mercury. Tasks for the veterinary pathologist with regard to the identification and examination of environmental compounds causing pathogenesis are outlined.

23863 APTIC NO. 43496

Ninova, Dafina

ANATOMICAL CHARACTERISTICS OF SMOKE RESISTANCE IN SOME WOODY PLANTS. *(Vurkhu anatomichnite pokazateli za dimoustoychivost pri nyakoi durvesni rasteniya). Gorskostop. Nauka, 12(4):9-18, 1970. 13 refs. Translated from Bulgarian. 13p.*

The role of the anatomical structure of leaves in smoke resistance and the effects of poison gases on those structures are described. Leaves of red oak, honey locust, white mulberry, Canadian poplar, Persian walnut, apple, and pear trees growing in the region around a copper mining combine were examined. The woody species with the greatest smoke resistance, red oak, honey locust, and mulberry, in the vicinity of the copper mining plant have the largest number of stomata per square millimeter of leaf surface, and the smallest stoma. These anatomical features occasionally are smoke resistance indicators. Comparison of the stomatic apparatuses of experimental and control variants extablished the fact that the number of stomata in the experimental variants of the smoke resistant species is greatly increased, an indication of the strengthening of the xeromorphic characteristics of plants when subjected to the effects of sulfur gas, as well as an indication of the considerable ecological pliancy of different smoke resistant species, and of the weaker ecological pliancy of the fruit tree species investigated. Analysis of the quantitative anatomical indices of blades failed to confirm the progressive increase in the numerical coefficient found in the literature; the coefficient of correlation between palisading and sponginess of tissue, and the regular decrease in the percentage of transventilation with increase in the smoke resistance of plants. Only in the mulberry do the xeromorphic indices correlate with the corresponding stomatic apparatus indices. The presence of gas causes the degree of transventilation to decrease in each of the species. There is a tendency to strong cutinization, and to consolidation of palisade cells, when sulfur gas is present.

23864 APTIC NO. 43494

Novak, Vladimir

A STUDY OF THE SUCCESSION OF BARK AND WOOD-BORING INSECTS ON TREES DAMAGED BY INDUSTRIAL SMOKE IN THE KRUSNA HORA REGION. *(Vyzkum sukcese podkorniho hmyzu na stromech chradnoucish vlivem prumyslovych exhalaci v Krusnych horach). Lesnictvi, 8(5):329-342, 1962. 13 refs. Translated from Czech. 27p.*

The results of observations on the activity of beetles (notably Trypodendron lineatum, Pityogenes chalcographus, Polygraphus poligraphus, Hylurgops palliatus, and Dryocoetes hectographus) in plots of smoke-damaged spruce in the Krusna Hora region of Czechoslovakia are discussed. Suggestions are made for sanitation felling and setting of trap logs, and the principal external symptoms of attack are described. (Author abstract modified)

23865 APTIC NO. 43301

Oden, Svante

SOME EFFECTS OF THE ACIDITY OF AIR AND PRECIPITATION. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 1:85 to 1:94. (Sept. 1-6.)*

Europe has an acidification problem with widespread effects on soil, biological and technical systems, and on the health of man. In 1956, the acidification center in Europe with a pH value less than 5.0 occurred over eastern England, Holland, and Belgium. Large parts of Scandinavia had almost neutral precipitation. In 1959, the less than pH 5.0 area had extended greatly, particularly in the north-easternly direction. A new acid class, less than pH 4.5, occurred over nothern Germany, Holland, and Belgium. In 1961 and 1966 the annual precipitation within the center had an acidity of less than pH 4.0. Yearly variations show that the air is more acid during the winter period than at other times. Measurements in Swedish lakes and rivers show that the pH value in a large number of Swedish rivers has constantly dropped during the years 1965 to 1970. Changes have been greatest in southern and central Sweden, within the area where the precipitation has been the most acid. Acid precipitation falling on soils leads to a depletion of the nutrient supply in the soil, and to reduced pH values. The turnover time for soil cations, including sodium, potassium, calcium, and magnesium, due to the fallout of acids was calculated to be 40 to 70 years. Assuming 60 years, the half-life for the inventory of cations will be approximately 40 years. The cumulative effect of sulfur dioxide on coniferous trees leads to a decomposition of the chlorophyll since the life time of the needles is up to 7 years. Lichens have proven to be a sensitive indicator of sulfur dioxide in the air. Since pH of precipitations is less than 5.5 for most of Europe, nitrogen fixation by blue-green algae is interfered with especially at more exposed positions.

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23866 APTIC NO. 43495

Przybylski, Zdzislaw

RESULTS OF OBSERVATION OF THE EFFECT OF SO2, SO3, AND H2S04 ON FRUIT TREES AND SOME HARMFUL INSECTS NEAR THE SULFUR MINE AND SULFUR PROCESSING PLANT AT MACHOW NEAR TARNOBRZEG. *(Wyniki obserwacji nad dazalaniem gazow i par SO2, SO3 i H2S04 na Drzeiwa Owocowe i niektore szkodliwe owady w rejonie kopalni i zakladow przetworczych siarki w Machowie k/Tarnobrzega). Postepy Nauk Rolniczych, no. 2:111-118, 1967. Translated from Polish. 10p.*

The effects of sulfur dioxide, sulfur trioxide, and sulfuric acid generated by a sulfur-processing plant on fruit trees, insect pests, and their natural enemies were studied at distances of 0.5 to 3 km in all directions from the plant. The most negative action of SO2, SO3, and H2SO4 gases and vapors on the life of plants and insects appeared on the northeast, east, north, and southeast sides of the sulfur processing plants. The harmful action of these gases is observed to a small degree in a radius up to 3 km from the north side of the plants. Shields in the form of buildings or resistant trees clearly influenced the improvement of environmental conditions in certain orchards. A ring of trees resistant to SO2 (for example, poplars) in a radius of 2 km around the plant would to a certain extent brake the transmission of plant gases to greater distances. The fruit tree pest most sensitive to the gases is the red fruit spider (European red mite). This pest constitutes to a certain extent an indicator for SO2, SO3, and H2SO4 gas and vapor concentration. Apple tree aphids are exceptionally resistant to the harmful action of the gases and their quantity was larger at observational points located 0.5 km from the plant. This would be evidence of lack of possibility of survival in this environment of the natural enemies of this pest.

23867 APTIC NO. 43389

Rancitelli, L. A.

TRACE ELEMENT CONTENT OF ALASKAN CARIBOU AND LICHEN. *In: Pacific Northwest Laboratory Annual Report for 1971 to the USAEC Division of Biology and Medicine, Volume II: Physical Sciences, Part 2. Radiological Sciences. Battelle Northwest, Richland, Wash., Radiological Sciences Dept., Rept. BNWL-1651(PT2), UC-48, p. 15-17, May 1972.*

NTIS: BNWL-1651- PT2

To elucidate the mechanisms responsible for radionuclide transport through the Alaskan food chain, a study was conducted of 15 elements in lichen and caribou, including silver, arsenic, bromine, cobalt, chromium, cesium, iron, mercury, potassium, sodium, rubidium, antimony, scandium, selenium, and zinc. The measurements were made by instrumental neutron activation analysis using 200 mg aliquots of caribou liver, muscle and kidney tissue and lichen samples which were simultaneously analyzed for their radionuclide content. Preliminary results of the trace element analyses of caribou revealed some trace element patterns similar to those observed in marine and aquatic organisms. Trace element content data is given.

23868 APTIC NO. 43349

Reinert, Richard A., David T. Tingey, and Hershell B. Carter

SENSITIVITY OF TOMATO CULTIVARS TO OZONE. *J. Amer. Soc. Hort. Sci., 97(2):149-151, March 1972. 14 refs.*

Twelve cultivars of tomato were exposed to 40 pphm ozone for 1.5 hr in separate morning and afternoon exposures to determine differences in cultivar sensitivity. Nearly all of the cultivars exposed in the afternoon developed more injury than similar cultivars exposed in the morning. Symptoms varied from a chlorotic mottle or spotting to an upper surface necrotic fleck. A bifacial necrosis developed as the injury severity increased. Cultivar ranking, however, was the same for morning and afternoon exposures. Roma VF and Red Cherry were the most sensitive and Heinz 1439 and VF 145B were the least sensitive of the cultivars tested. (Author abstract modified)

23869 APTIC NO. 43462

Reinert, Richard A., David T. Tingey, and Hershell B. Carter

SENSITIVITY OF TOMATO CULTIVARS TO OZONE. *Preprint, Agricultural Research Service, Raleigh, N. C., Plant Science Research Div. and Environmental Protection Agency, Raleigh, N. C., Div. of Effects Research, 15p., 1972. 14 refs.*

Twelve cultivars of tomato were exposed to 40 pphm ozone for 1.5 hrs in separate morning and afternoon exposures to determine differences in cultivar sensitivity. Nearly all of the cultivars exposed in the afternoon developed more injury than similar cultivars exposed in the morning. Cultivar ranking, however, was the same in morning and afternoon exposures. Ozone injury symptoms were similar among the various tomato cultivars. The recently matured leaves of the plant were more sensitive to ozone than the younger immature leaves, and frequently the terminal leaflet of the five leaflets comprising the tomato leaf was injured first. Symptoms varied from a chlorotic mottle or spotting to an upper surface necrotic fleck. A bifacial necrosis which was usually interveinal developed as the injury severity increased. Occasionally, upper surface fleck tended to form primarily along secondary and tertiary veins. Roma VF and Red Cherry were among the most sensitive cultivars tested and Heinz 1439 and VF 145B were the least sensitive of the 12 tomato cultivars tested. (Author abstract modified)

23870 APTIC NO. 42715

Shupe, James L., Wayne Binns, Lynn F. James, and Richard F. Keeler

LUPINE, A CAUSE OF CROOKED CALF DISEASE. *J. Am. Vet. Med. Assoc., 151(2):198-203, July 15, 1967. 21 refs.*

Lupine, lupine and lead, and lead alone were fed to cows to evaluate their teratogenic effects. Lupine proved to be a cause of crooked calf disease, which was characterized by either arthrogryposis or torticollis and scoliosis or both, and occasionally cleft palate. The principle time of insult for the front limbs was between the 40th and 70th day of gestation, although slight to moderate malformations did occur when lupine was fed to cows before and after this period. The severity of the deformity was not necessarily correlated with the severity of the signs of poisoning. Lupine toxicosis is related to its high alkaloid content. (Author summary modified)

23871 APTIC NO. 43511

Stoefen, D.

LEAD INDUCED FETAL ALTERATIONS IN GRAZING CATTLE? (Bleibedingte Keimschaeden beim Weidevish)? Text in German. Zuchthygiene, 4(4):169-173, 1969. 32 refs.

Observations and experiments on the effects of lead on animals and man are reviewed. The daily lead intake by grazing cattle may lie at 112-167 micrograms/kg body weight. Doses of 1 mg/day or 14 micrograms/kg body weight have had a pathological effect. The toxic effect is dependent on endogenous or exogenous fluctuations in the blood lead level, caused by local factors, rather than on the blood level itself, which is largely constant. Psychic, and particularly fetal, effects appear much earlier than physiopathological ones. Lead represents a major fetal hazard. The synthesis of ribonucleic acids is inhibited by lead which also penetrates the fetus. Malfunction of the ovary, menstruation problems, sterility, omotocia, and increased infant mortality due to lead were observed. High lead doses had teratogenic effects in animal tests. Brain damages in infants such as hydrocephalus, idiocy, spasms, infantilism, and rachitis were found. Atrophy of the seminiferous tubules, damages of the parenchyma in sex

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glands, and reduced spermatogenesis were observed. Oral doses of six times 0.002 mg/kg and six times 200 mg/kg body weight had largely the same effects (damaged testes and sperms, edemas in interstitial tissues, and necrosis of seminiferous tubules). Sensibilization of allergenics and inhibition of immunologic reactions by lead were revealed.

23872 APTIC NO. 43217

Swain, R. E. and W. D. Harkins

PAPERS ON SMELTER SMOKE; ARSENIC IN VEGETATION EXPOSED TO SMELTER SMOKE. *J. Am. Chem. Soc., 30(6):915-928, June 1908. 9 refs. (Presented at the American Chemical Society, Meeting, New York, Dec. 1906.)*

As a result of a previous investigation it was estimated that the Anaconda Plant in Montana was discharging daily from its main chimney an average of 59,270 lb of arsenic trioxide. The primary incentive for this study was the claim on the part of the farmers, residing in this area, that they were suffering abnormal losses of live-stock, which they attributed to smelter fumes. A chemical analysis of the hay and wild grasses was conducted, using an application to plant tissue of the Chittenden-Donaldson method for the destruction of animal tissue. Arsenic content in the resulting extract was estimated by applying the Marsh-Berzelius method and weighing the mirrors which resulted. Values as high as 0.0263% of arsenic trioxide were obtained from mature plants which had grown five miles from the smelter. Complaints were often made by men, working on thresher machines, that the thresher dust from grain in the smoke zone irritated the skin and the mucous membranes of the eyes and nasal passages. Arsenic content of samples of hay and the dust shaken from the hay were compared. The dust shaken from hay, averaging 87 ppm or arsenic trioxide contained an arsenic content of 978 ppm. In another sample, the dust contained 7700 ppm of arsenic trioxide, while the hay itself carried only 261 ppm. These results indicate that the arsenic was deposited on the surface of the plant and was not distributed throughout the tissue. The study concluded that the source of the arsenic found in such excessive amounts in the vegetation of the region about Anaconda was the smelter smoke emitted by the plant and that the quantity which was given off under those smelting conditions was not likely to be reduced except by the use of a less highly arsenical ore.

23873 APTIC NO. 43461

Taube, Chr., H. Fiedler, and N. Hartmann

INHIBITION OF BLOOD COAGULATION IN RABBITS AFTER PARENTERAL ADMINISTRATION OF COBALT (II) COMPOUNDS. *(Versuche ueber die Hemmung der Blutgerinnung bei Kaninchen nach parenteraler Verabreichung von Kobalt (II)-verbindungen). Acta Biol. Med. Ger., vol. 19:683-690, 1967. 15 refs. Translated from German. 11p.*

Changes in the coagulation system of rabbits due to the biological effects of parenterally administered cobalt (II) salts and cobalt (II) amino acids have been investigated. In the dose range of 2 to 5 mg Co/Kg, complete inhibition of coagulation was produced over a time period from about 1 to 10 hr following injection. Partial or even total gelatinization of the plasma did occur, but the transparency of the plasma was not appreciably changed by this process. One hour after injection, fibrin could no longer be precipitated, the transparent deposit being gelatinized homogeneously. The retractility of the fibrin clot was reduced in all cases just 10 to 30 min after the administration of 1 to 5 mg Co/kg and was still deficient even after 24 hr, in spite of the fact that fibrin values had been normalized again. None of the cobalt (II) compounds studied manifested appreciable differences in the inhibition of blood coagulation. The state of incoagulability of the blood could be induced several times. When the intervals between individual injections were shortened to 8 to 10 hr, the blood remained incoagulable for several days. The activities of asparatate and alanine aminotransferases in the plasma remained essentially unchanged following one-time subcutaneous injection of cobalt (II) salts. Results show a symptomatic similarity with the inhibition of coagulation by salts of the rare earths with an interpretation of the action of cobalt as the inhibition of fibrin polymerization.

23874 APTIC NO. 42945

Tenconi L. T. and G. Agocella

CHEMOTHERAPY OF EXPERIMENTAL LEAD POISONING. I. EFFECTS OF LEAD POISONING ON THE METABOLISM OF TRYPTOPHAN TO NICOTINIC ACID IN RATS. *(Studio sulla chemotherapia dell intossicazione sperimentale da piombo. Nota l-Effetti dell avvelenamento da piombo sul metabolismo triptofano-acido nicotinico nel ratto). Text in Italian. Acta Vitaminol. (Milan), 20:189-194, 1966. 10 refs.*

The effects of lead poisoning on the tryptophannicotinic acid metabolic pathway were studied with reference to pyridoxine deficiency, which apparently occurs in lead-intoxicated rabbits, in order to determine parameters for use in chemotherapeutic tests in experimental saturism. Rats were given 300 mg/kg/day lead acetate for 30 days; coproporphyrins and xanthurenic acid in urine were determined at 10-day intervals. Coproporphyrin elimination increased from the start of the feeding while xanthurenic acid, an index of pyridoxine deficiency, was initially unchanged and did not diminish until after the 30th day of feeding. Kynurenic acid, orthoamino-hippuric acid, kynurenine, acetylkynurenine, 3-OH-kynurenine, and N1-methylnicotinamide were unchanged. Lead intoxication in rats does not produce the changes in tryptophan metabolism, manifested by pyridoxine deficiency, observed in rabbits, but the increased elimination of coproporphyrin does point to a defect in porphyrin metabolism attributable to lead poisoning in both rat and rabbit. A metabolic disturbance in the tryptophan-nicotinic acid pathway can be assumed even in rats, although it may only take the form of a blockage of the first metabolic stage. The reduced elimination of tryptophan metabolites by poisoned rats (11, compared with 27 micro M in controls) could also be attributed to reduced amino acid absorption. Histologic examination revealed lesions in the intestinal wall of the poisoned rats probably associated with changes in the intestinal microflora.

23875 APTIC NO. 43655

Tingey, David T., Richard A. Reinert, John A. Dunning, and Walter W. Heck

FOLIAR INJURY RESPONSES OF ELEVEN PLANT SPECIES CAUSED BY OZONE/ SULFUR DIOXIDE INTERACTIONS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Div. of Ecological Research and Agricultural Research Service, Raleigh, N. C., Plant Science Research Div., 20p., 1972 (?). 20 refs.*

Eleven plant species were exposed to ozone and/or sulfur dioxide to determine if a mixture of the two phytotoxic gases enhanced foliar injury. Tobacco, radish, and alfalfa exposed to a mixture of 5 pphm O3 and 25 pphm SO2 developed more injury than the additive injury of the single gases. In other species, such as cabbage, broccoli, and tomato, the foliar injury from 10 pphm O3 and 100 pphm SO2 was additive or less than additive. Leaf injury from the ozone/sulfur dioxide mix appeared as upper surface flecking, stipple, bifacial necrosis, and lower surface glazing and, in general, appeared similar to injury from oxidant or O3. The concentrations of O3 and SO2 which caused plant injury were similar to those found in urban areas, and may result in yield losses to plants grown under field conditions. (Author abstract modified)

23876 APTIC NO. 43596

Vos, J. G.

TOXICOLOGY OF PCBS FOR MAMMALS AND FOR BIRDS. *Environ. Health Perspect., 1972:105-117, April 1972. 39 refs.*

Indications of the presence of toxic impurities in polychlorinated biphenyl (PCB) preparations were obtained in a comparison of the toxicity of three commercial PBC samples (containing 60% chlorine on the average): Phenoclor DP6 (sample I), Clophen A60 (sample II), and Aroclor 1260 (sample III). These three mixtures showed a marked resemblence in their gas chromatograms. However, in a comparative feeding test on one-day old chicks, 100% mortality, subcutaneous and abdominal edema, and centrolobular liver necrosis occurred in only two groups (fed samples I and II). Hydropericardium, a common effect of the first two mixtures, was only occasionally seen in the chicks fed sample III, and the mortality in this group was only 15%. By means of column and gas-chromatography the presence of relatively more polar compounds was demonstrated in the 25% diethylether fraction of samples I and II. Mass spectrometric analyses revealed that identical chlorinated compounds, including tetrachlorodibenzofuran and pentachlorodibenzofuran, were present in the 25% diethylether fraction from samples I and II but not from sample III. These polychlorinated dibenzofurans are strong hepatotoxic and acnegenic compounds. Previously conducted oral toxicity studies of PCB preparations on various birds and mammals are summarized. It is very probable that the results of these studies may have been influenced by the presence of polychlorodibenzofurans or other toxic impurities. Since porphyria seems to be an effect of PCBs the induction of ALA synthase could be used as a criterion in the approximation of a no-effect level for the PCBs.

23877 APTIC NO. 43279

Warnick, Stephen L. and Henry L. Bell

THE ACUTE TOXICITY OF SOME HEAVY METALS TO DIFFERENT SPECIES OF AQUATIC INSECTS. *J. Water Pollution Control Federation, 41(2):280-284, Feb. 1969. 12 refs.*

The acute toxicity was determined of the salts of copper, zinc, cadmium, lead, iron, nickel, cobalt, chromium, and mercury to three species of aquatic insects as a first step in the development of criteria for protecting these important fish-food organisms. The three species of insects used were: the stonefly, (Plecoptera) Acroneuria lycorias; the mayfly, (Ephemeroptera) Ephemerella subvaria; and the caddisfly, (Trichoptera) Hydropsyche betteni. Ten individuals of each species were used in each metal concentration and control. Analysis of the killed insects revealed significant amounts of metal had been absorbed. Ephemerella was the most sensitive to all the metals, copper being the most toxic at 0.32 mg/l (48-hr median tolerance limit (TLm), followed by iron at 0.32 mg/l (96-hr TLm); cadmium, chromium, and mercury at 2.0 mg/l, and cobalt at 16 mg/l, (all 96-hr TLm). Mercury also was toxic to Acroneuria at 33.5 mg/l, and cobalt to Hydropsyche at 64.0 mg/l, (also 96-hr TLm). In all other cases the test organisms lived beyond 96 hr, even at concentrations up to 64.0 mg/l, indicating that the aquatic insects may not be as sensitive to the heavy metals as are fish.

23878 APTIC NO. 42607

Webber, M. D.

A COMPARISON OF IGNITION TREATMENTS FOR PB MEASUREMENT IN PLANT TISSUES. *Can. J. Soil Sci., 52(2):282-284, June 1972. 4 refs.*

Dry ignition at 460-500 C is frequently used to prepare plant tissue for lead analysis; however, it was observed that measurements for tissues following one dry ignition at 500 C were larger than after two ignitions. Consequently, a comparison of ignition treatments for analysis of lead in hay and pasture samples was carried out. Although the data for comparison of ignition treatments are incomplete, there was generally good agreement between the measurements after one dry ignition at 430 C; one dry ignition at 430 C followed by sodium carbonate fusion; and wet ignition with nitric acid, perchloric acid. Dry ignition at 450-500 C caused large reduction of Pb. Dry ignition at 300-430 C tested with one tissue and at 430 C tested with all tissues gave complete recovery of lead, but a large amount of unoxidized carbon remained. Wet ignition with HNO3 and HClO4 yielded complete recovery of Pb and rapid and complete oxidation of plant tissues.

23879 APTIC NO. 42888

Wrobel, S.

THE EFFECT OF SULFUR DIOXIDE ON WATER ORGANISMS. *(Ueber den Einfluss von Schwefelkioxyd auf Wasserorganismen). Text in German. Fortschr. Wasserchem. Ihrer Grenzgeb., no. 14:181-185, 1972. 6 refs.*

Tests were made in 1968 concerning the effect of sulfur dioxide on phyto and zooplanktons in ponds, and on fish. Three series of tests were conducted. In the first series, 1 mg of SO2/l of water was brought in at the beginning of the test only, in the second series 2.8 mg SO2/l was added under otherwise equal conditions, in the third series these quantities were used daily in the course of tests lasting 6 days. No toxic effect on the phytoplanktons was found in any of the three test series, i.e., neither the chlorophyll content nor the intensity of the photosynthesis deviated from that of the untreated reference specimen. With regard to zooplanktons, the daily addition of 2.8 mg SO2/l of water had no toxic effect, but at triple this concentration 100% of the animals died after 4 days. Death occurred about 3 hr after the pH value of the water had dropped below 5.5. Fish died when the pH value had gone down to 4.0. The cause of death was not the direct action of the sulfur dioxide, but the change in pH value. Contrary to plants and animals, the water organisms, except the macrophytes, are not affected by the direct action of the gaseous sulfur dioxide, but by sulfuric acid and its salts.

23880 APTIC NO. 42907

Yu, Ming-Ho, Gene W. Miller, and C. James Lovelace

GAS CHROMATOGRAPHIC ANALYSIS OF FLUOROORGANIC ACIDS IN PLANTS AND ANIMAL TISSUE. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 156-158. 15 refs. (Dec. 6-11, Paper MB 4E.)*

Studies to develop gas chromatographic techniques for the determination of organic, specifically fluoroorganic, acids in tissue, and to determine organic acid changes induced by fluoride injury are reported. A gas chromatograph was used with a flame ionization detector. Analyses were carried out on dual columns using helium carrier gas. Tissues were obtained from soybean plants fumigated with approximately 60 ppb of atmospheric hydrogen fluoride for 4 days. Leaves from soybean plants grown in a chamber fumigated with ambient air were used as controls. Kidneys and hearts from cows and horses suffering severe fluorosis were used in further studies. Results indicate that several organic acids and other volatile compounds in the fluoride treated tissue changed in concentrations compared to control tissue. Cis-aconitate, citrate, and oxalate were not determined. Malate, malonate, and succinate increased markedly in concentration when plants were exposed to hydrogen fluoride.

23881 APTIC NO. 42969

Zealear, Kristina A., Robert C. Heller, Nancy X. Norick, and Marilyn Wilkes

THE FEASIBILITY OF USING COLOR AERIAL PHOTOGRAPHY TO DETECT AND EVALUATE SULPHUR DIOXIDE INJURY TO TIMBER STANDS. *Forest Service, Berkeley, Calif., Pacific Southwest Forest and Range Experiment Station, 158p., Nov. 1971. 5 refs.*

NTIS: PB 205-279; GPO

A feasibility study was conducted in Alabama near a point source of sulfur dioxide emissions to determine the best film-filter-scale combination of aerial photography to evaluate SO2 damage to forest vegetation. Normal color film, exposed through a didymium filter, at very large scales (1:800 and

1:1584) proved to be the most accurate sensor. Color infrared film was almost as good. Interpreter differences were least at large scale and on color film. Ground variables that were best correlated with photo interpretation were: crown color, needle color, Munsell hue, percent of current needles with tip dieback, and the length of the tip dieback. Because fumigation effects are cumulative, total injury impact on the resource will have to be measured over a 5-6 year period. A combination of photo and ground plots appears to be the most efficient design for measuring these effects, expecially if done over large areas. (Author abstract modified)

EFFECTS-MATERIALS

23882 APTIC NO. 42749

Beloin, Norman J.

FADING OF DYED FABRICS EXPOSED TO AIR POLLUTANTS: A CHAMBER STUDY. *Preprint. Environmental Protection Agency, Research Triangle Park, N. C., Technical Center, 22p., 1968 (?). 15 refs.*

Twenty dyed fabric combinations were exposed to two levels each of nitrogen dioxide, ozone, sulfur dioxide, and nitric oxide at four combinations of temperature and humidity for 12 weeks. Color was measured photoelectrically with a color difference meter. Appreciable fading resulted from NO2, O3, and SO2 exposure. In addition, it was confirmed that temperature and relative humidity have significant effects on dye fading. (Author abstract modified)

23883 APTIC NO. 42310

Forrest, J. S.

THE PERFORMANCE OF HIGH-VOLTAGE INSULATORS IN POLLUTED ATMOSPHERES. *(Katarreusis logo barytetos kai melavnai hopai). Text in Greek. Tech. Chron. (Athens), 4(550):257-267, April 1972. 26 refs.*

The characteristics and performance in service of insulators for high-voltage overhead transmission systems operating in areas subject to industrial pollution, fog, or salt storms are discussed. Two types of research installations are described: the natural pollution testing station and the artificial pollution laboratory in which the service conditions are simulated in some form of controlled test. The development of the Salt Fog Artifical Pollution Test is described in detail. The mechanism of insulator flashover in humid and polluted atmospheres is discussed, and it is shown that the basic cause of flashover is the formation of dry bands and the development of a nonuniform voltage distribution over the insulator surface. The voltage that an insulator will withstand in polluted atmospheres is approximately proportional to the total leakage path length and an improvement in service performance can be achieved by using anti-fog insulators with long total leakage paths. A minimum leakage path length of 2.5 cm/kV rms of system voltage is desirable, and in practice a figure of 32 cm/kV is often adopted to give a larger margin of safety. A further improvement in performance can be obtained by coating the insulator surfaces with a thick layer of grease. Live washing of the insulators is also effective. The voltage distribution over the insulator surfaces and hence the tendency to flashover can be controlled by using insulators with a semiconducting glaze of the appropriate resistivity. Insulators for high-voltage direct-current systems are discussed. To give equivalent service performance in polluted atmospheres, a longer length of leakage path is required than for similar insulators on an ac system with a peak voltage equal to the voltage of the dc system. (Author summary modified)

23884 APTIC NO. 42404

Fujisaki, Mamoru, Kunio Ishii, and Kazuyoshi Nishino

MATERIAL AND CORROSION OF DESULFURIZING PLANTS. *(Datsuryu sochi ni okeru kosei zairyo no fushoku sonsho). Text in Japanese. Sekiyu Gakkai Shi (J. Japan Petroleum Inst., Tokyo), 14(9):691- 695, 1971. 10 refs.*

Examples of plant corrosion accidents experienced with desulfurization apparatus are described. Approximately 80% of the damages concern stress cracking caused by sulfur compound corrosion. The corrosion occurs mainly in a sulfur compound atmosphere at dry and high temperature conditions, dry or wet at low temperatures, or high temperature and low pressure conditions; it occurs in apparatus made of carbon steel, chromium-molybdenum (1:1/4), steel, and copper. A method was developed for improving the anti-corrosive activity of Cr-Mo steel, giving good results on the desulfurization apparatus. The steel is treated with iron-aluminum alloy powder containing small amounts of aluminum chloride at 800-1000 C. An Fe-Al alloy film is formed on the steel surface due to the diffusion-permeation of the powder. The film is tightly attached to the surface of the treated steel. Experimental results of five steels thus treated show that corrosion was decreased to 1/1000 2s compared to untreated steels.

23885 APTIC NO. 43556

Haagen-Smit, A. J., M. F. Brunelle, and J. W. Haagen-Smit

OZONE CRACKING IN THE LOS ANGELES AREA. *Rubber chem. Technol., vol. 32:1134-1142, Oct.-Nov. 1959. 15 refs. (Presented at the American Chemical Society, Division of Rubber Chemistry, Los Angeles, Calif., May 14, 1959.)*

Cracking of rubber, due to the presence of ozone, was determined in the Los Angeles area by measuring the number of cracks and the crack depth after exposure of standardized bent rubber strips to the atmosphere. The cracking shows a daily and seasonal variation due to the difference in ozone concentration as well as difference in temperature. Results over a three year test period are presented, as well as a comparison with oxidant and ozone values measured in the same area. The ozone concentration usually reaches a maximum during the day and is highest during the summer months. Its origin has been traced to the action of sunlight on mixtures of organic material and oxides of nitrogen, common air pollutants in urban areas. A comparison with chemical measurements of the oxidizing power of the air shows a similar trend. The rubber test is useful in the correct interpretation of outdoor exposure tests of rubber goods, since it integrates the variable action of ozone due to large fluctuations in its concentration and the reaction rate due to climatological factors. Application of the test to area surveys in air pollution studies is suggested. (Author summary)

23886 APTIC NO. 43425

Hattori, T., Y. Matsuyama, J. Ueda, M. Kadoma, K. Okazaki, Y. Yorozutani, N. Takeda, J. Takimoto, H. Kawaguchi, H. Yamada, M. Saruwatari, F. Fijikawa, K. Hirai, A. Hirayama, and M. Fujii

INVESTIGATION ON THE EFFECTS OF AIR POLLUTION ON NATIONAL CULTURAL OBJECTS. REPORT NO.5 (Taiki osen ni yoru bunkazai ni taisuru eikyo chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):140, 1969. (Presented at the Japan Society of Air Pollution, Annual Meeting, 10th, Tokyo, Japan, 1969, Paper 139.)

Alkaline filter paper tests of sulfur dioxide, nitrogen dioxide, and chlorine ion were applied to evaluation of air pollution effects on silver foil texture, direct red dye, and brilliant blue diffusion dye used in National Cultural Objects of Japan. The results of indexes obtained in summer and winter with regard to the degree of change of color and fading and the measurements of pollutants are presented in table form. Pollution concentration in winter was higher than summer, and the total of the damages recognized on the texture of silver foil and dye colors was slightly higher in summer than winter. Questionnaires were sent to temples and shrines that owned these cultural objects. Regardless of the season, a correlation was recognized between the existence of bus stations and stops near the edifices and a high degree of blue color fading, or a high nitrogen oxide index and the color fading. Regardless of the season, a correlation was noted between the existence of factory stacks in the vicinity of the edifices and a high degree of fading of red color, or a high sulfur dioxide index and a high degree of color fading. The questionnaires revealed that there was a correlation between higher chlorine ion index in summer and an existence of a polluted river in the vicinity; in the same locality, the chlorine ion index was lower in winter. A strong correlation was recognized between the metal texture change rate and SO2 concentration higher than 0.12 mg/day 1pp sq m. A strong correlation was also recognized between fading of the red dye and SO2 concentration higher than -.18 mg/day/100 sq cm. There was no clear correlation between SO2 pollution and the blue dye. A strong correlation was recognized the fading of the blue dye and a NO2 concentration higher than 0.018 mg/day/100 sq cm.

23887 APTIC NO. 42401

Jellinek, H. H. G. and A. K. Chaudhuri

INHIBITED DEGRADATION OF NYLON 66 IN PRESENCE OF NITROGEN DIOXIDE, OZONE, AIR, AND NEAR-ULTRAVIOLET RADIATION. *J. Polymer Sci., vol. 10:1773-1788, 1972. 22 refs.*

Degradation of nylon 66 films of different morphologies was studied in the presence of nitrogen dioxide, ozone, oxygen, and near ultraviolet radiation. Films cast from formic acid solution showed normal random degradation, whereas films cast from benzyl alcohol solutions and dried at elevated temperatures under nitrogen showed very strongly inhibited random degradation. This inhibition may be due to protection of peptide groups by hydrogen bonding with benzaldehyde or benzoic acid or even to their chemical reactions at elevated temperatures. Oxygen was not rigorously excluded during preparation of the films. Degradation of nylon 66 films cast from formic acid solutions at room temperature containing benzaldehyde or benzoic acid, respectively, is also inhibited. The energy of activation for inhibited degradation in the presence of NO2 is relatively small, indicating that the process is controlled by diffusion of polymer radicals from medium cages or by diffusion of gases into the polymer. The degradation kinetics can be expressed by weak link random degradation. The weak links in the present case are unprotected peptide groups. The functional relationship between chain scission rate constants and NO2 pressure is linear. (Author summary modified)

23888 APTIC NO. 42467

Merrifield, Dudley B.

METAL STABILIZERS FOR RUBBER. *(Monsanto Chemical Co., St. Louis, Mo.) U. S. Pat. 2,954,356. 3p., Sept. 27, 1960. 10 refs. (Appl. Oct. 17, 1955, 9 claims).*

A process for manufacturing vulcanized rubber is described employing special additives, some in not more than trace amounts. By the addition of such additives as lead and copper oxides and fatty acid rubber-soluble salts such as stearates, oleates and palmitates of lead and copper, iodides, or even water-soluble salts as the acetates of lead and copper, resistance of the vulcanized rubber compound to degradation by ozone is greatly increased. Preferably, the vulcanization of such a compound is carried out in the absence of free sulfur but by means of a suitable sulfur-containing organic compound or, alternatively, by the combination of such an organic sulfur compound with less than one half the quantity of free sulfur normally required for the rubber compound. Resistance to aging and heat buildup is also effected. The improvement is additive; therefore, the metals are used to advantage in conjunction with an organic antidegradation agent, as for example phenothiazine, diphenyl-p-phenylenediamine and other p-phenylenediamine derivatives and the dihydroquinolines.

23889 APTIC NO. 42815

Suzuki, Ryoji

CORROSION OF AIR CONDITIONER PIPING BY AIR POLLUTION. *(Taiki osen ni yoru kucho haikan no fushoku). Text in Japanese. Haikan (Piping), 7(4):59-63, April 1972. 4 refs.*

Water acidified by sulfur oxides in air may cause the corrosion of piping in air conditioners. Experimental results show that at a pH value lower than 4, the corrosion of iron proceeds extremely rapidly; zinc deteriorates at both high and low pH value. Water containing large amounts of chlorine is more acetic and has the same effect. Proper maintenance of the machines requires constant measurement of the pH value of the water; undesirable water can either be replaced or treated with chromates, polyphosphates, or mixtures of these.

EFFECTS-ECONOMIC

23890 APTIC NO. 42925

ECONOMIC EFFECTS OF AIR POLLUTION. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 7, p. 73-76. 10 refs.*

The aggregate of the expenditures attributable to air pollution, on the part of industries in the installation and maintenance of control equipment, by governmental agencies for control, to farmers in loss of crops and livestock, in research programs, in the settlement of litigation due to air pollution, and in more frequent replacement of articles damaged by air pollution, is highly impressive. Considering all these factors, it costs the people of the U. S. $2 billion/yr. Excessive shortening of the life and soiling of home furnishings and clothes, both in the stores and in the home, is familiar to those people living and working in urban areas. The blighting and subsequent reduction of value of large sections of urban areas is well known, causing loss to the property owner and to the community through loss of taxes. Air pollution causes damage to building materials, and the economic loss to many farmers and livestock men has been considerable.

23891 APTIC NO. 43547

Benedict, H. M. and R. E. Olson

ECONOMIC IMPACT OF AIR POLLUTANTS ON PLANTS. VOLUME I. *Stanford Research Inst., Irvine, Calif., Coordinating Research Council Contract APRAC-CAPA-2-68, Report CRC-CAPA-2-68-1, 68p., Jan. 1971. 13 refs.*

NTIS: PB 200235

The loss in dollars that occurs annually as a result of the effects of air pollutants on plants has been estimated. The program has involved individuals trained in agricultural economics and in physiologic and pathologic reactions of plants to air pollutants. The study was limited to the effects of ozone, peroxyacly nitrates, nitrogen dioxide, sulfur dioxide, and fluorides, as these compounds appear to account for at least 90% of the damage to vegetation by air pollutants. In the initial phases of the study, estimates of loss are limited to the direct effects of these pollutants on yield, quality, and marketability of important commercial crops, with losses for ornamental plants based on losses to vendors. Dollar loss estimates were made for each crop reported for each county where air pollution sources apparently existed. These estimates included losses due to ozone, nitrogen oxides, PAN, sulfur dioxide, and fluorides. (Author abstract modified)

23892 APTIC NO. 42746

Bertrand, Rene R.

A STUDY OF MARKETS FOR AIR POLLUTION MEASUREMENT INSTRUMENTATION 1971-1980. *Esso Research and Engineering Co., Linden, N. J., Office of Air Programs Contract CPA 22-69-154, 93p, June 1971. 20 refs.*

NTIS: PB 204174

The market for air pollution instrumentation during the decade of the seventies was determined. The market analysis presented is based on the survey of instrumentation requirements conducted at the federal, state, and local level and on an analysis of current legislation and air pollution control codes. The market for three areas of measurement instrumentation is estimated: ambient level monitoring, stationary source emission measurement, and auto exhaust measurement. This market amounts to nearly $500 million during the coming decade, some 76% of which represents initial purchases of air pollution measuring equipment. Industry will be the major purchaser of instrumentation, accounting for 45% of the market. The market is heavily oriented towards stationary source emission measurement, this area accounting for half the total instrumentation market value. Timing is a critical factor in the market with each of the three areas of measurement reaching maturity at different periods during the decade. In the study of the market for ambient air quality monitoring, only instrumentation required for particulates, sulfur dioxide, oxidants, carbon monoxide, hydrocarbons, nitrogen oxides, fluorides, polynuclear organic matter, and odors is considered. The market estimate for stationary source emission measurement instrumentation includes instrumentation for continuous source monitoring of particulates, SO2, nitrogen oxides, hydrocarbons, CO, and fluorides. (Author abstract modified)

23893 APTIC NO. 42348

B[illegible]nsky, Gene

THE MOUNTING BILL FOR POLLUTION CONTROL. *Fortune, vol. 84:86-89, 130 132, July 1971.*

In 1971 U. S. manufacturing plants and utilities spent at least $1.5 billion on air and water pollution control. This spending will accelerate, and the cumulative total for the next five years is apt to be close to $20 billion. The new laws and other pressures on business men, requiring vast investments on which there often can be no direct return, represent a fundamental alteration of the rules of business. Sulfur oxides, presenting an unparalleled challenge to designers of pollution-control systems, are the most pervasive of all air contaminants. Coal and oil- burning power plants emit 20 million tons of sulfur dioxide into the air each year. Sulfur oxides cause damage to health, materials, property, and vegetation that amounts to $8.3 billion a year. At the present time there is no economically viable technology that can effectively suppress sulfur oxide emissions. Scrubbing the oxides with limestone and trapping sulfuric acid mist in the stack are two methods now under investigation. To speed up sulfur oxide control technology, President Nixon has proposed a tax on sulfur in fuel; this tax would probably be paid by oil and coal companies. Nitrogen oxides, created by high-temperature combustion, contributor considerably to photochemical smog. Their control may require $1.7 billion in capital outlays in the next five years to control emissions from existing boilers. The technological solution to the problem of these air pollutants is nuclear power plants, as they do not emit any pollutants gases; however recent controversies concerning their environmental safeness have slowed their construction.

23894 APTIC NO. 43470

Davis, Warren B.

WORLD FOSSIL FUEL ECONOMICS. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, New York, N. Y., 30p., 1971. 15 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, New York, Feb. 26 - March 4, 1971.)*

World energy demand trends projected to 1985 show that the U. S. and Western Europe will use less oil, gas, and coal than in the past. The U. S. consumed 55% of the world s oil, gas, and coal in 1950 and is expected to use 38% in 1985. Nuclear power is expected to supply over 16% of the U. S. energy needs in 1985. Western Europe is now going through the transition from coal to oil and gas, and, though 40 yrs later than the U. S., is converting half again as fast. Oil production in the U. S. is in stiff competition with foreign markets. Recent reserve additions to the domestic supply have not been enough to replace lost production. Foreign production costs are less than domestic costs because foreign yields/well are greater: i.e., U. S., 17 bbl/d; Canada, 58 bbl/d; Venezuela, 300 bbl/d; Middle East, 4400 bbl/d. Oil transportation costs are very sensitive to the supply and size of tankers, and the distance to be moved. Federal regulation of the natural gas price has led to a domestic shortage. The production of oil from oil shale and bitumen tars still costs twice as much as pumping oil from a well. The U. S. government must decide how to provide a long-term supply of low cost fuel. The choice is between higher cost synthetic fuel or low-cost foreign fuel and acceptance of the fact that the U. S. would be vulnerable to political pressures by the producing countries.

23895 APTIC NO. 43465

Glenn, Wayne E.

FREE WORLD ENERGY RESOURCES - PETROLEUM, COAL, NUCLEAR. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers (AIME), New York, N. Y., 12p., 1971. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, New York, Feb. 26 - March 4, 1971.)*

In 1969 Free World energy demand, in terms of crude oil equivalents, reached almost 70 million bbl daily, with the U. S. requiring 30 million B/D and free foreign areas 37 million B/D. By 1990 Free World energy demand is expected to reach 180 million B/D. This projection involves an average annual energy growth rate of 4% for the U. S., 5.4% for free foreign areas, and 4.8% overall. Given the demand growth rates now projected, Free World oil consumption should total about 465 billion bbl between now and 1990, an amount equal to virtually all known reserves. Estimated additions to reserves over the next two decades total 392 billion bbl, an amount which could meet world demands for 12 additional years after 1990. Free World natural gas consumption during the period to 1990 will total 845 Tcf. Free World reserves of natural gas at the end of 1969 were estimated at 1156 Tcf, of which 290 Tcf are located in the U. S. The overall prospects for new additions to natural gas reserves are good. During the next 20 years, coal demand will be about 31 billion tons, of which about 14 billion will go to meet U. S. demands. The Bureau of Mines estimates economically recoverable reserves in the U. S. to be 380 billion tons. Approximately the same total tonnage is estimated for the combined free nations. Assuming that a breeder reactor is not availble commercially before 1990, uranium reserves totalling 2.3 million tons (about two and one half times the proven reserves today) must be discovered to meet the estimated demand for 1.7 million tons of uranium in the next 20-years and to maintain forward reserves in 1990 of about 1.5 million tons. Many sections of the world have not yet been explored for uranium.

23896 APTIC NO. 42464

Gordon, Richard L.

CHANGING PATTERNS IN INTERFUEL COMPETITION FOR THE GENERATION OF ELECTRICITY. *Preprint, Pennsylvania State Univ., University Park, 9p., 1972 (?). 3 refs.*

Two forms of electric-power fuel-source substitution are taking place. The more widely recognized one is the slow process of building nuclear plants to take over from fossil fuels. The other is the overlooked issue of forced shifts among fossil fuels to meet environmental regulations. Several basic considerations influence conditions on the East Coast, including fuel-supply conditions, the nature of available transportation, and the structure of the electric power industry. Since 1966, oil use by East Coast utilities rapidly increased. This has involved both rising consumption by established oil users and the extension of use to other companies. Both import decontrol and environmental regulations have influenced this shift. Oil-coal competition is not the only type of interfuel rivalry that has prevailed in the electric power market. At the fringes of the main market area, coal and gas have competed. Explicit oil-gas competition has been relatively unimportant. In the competition of the three main fossil fuels with nuclear power, coal is in a weak position east of the Mississippi but in a strong one in the West. Many uncertainties arise in the residual oil and natural gas sectors. Two threats exist to the availability of residual oil at prices competitive with nuclear power: developments in the world market could raise prices; alternatively, U. S. oil policies could cut off imports or in other ways produce substantial independent rises in U. S. oil prices. Long-term trends away from the use of fossil fuels are expected to create difficulties in the transition of coal-fired facilities.

23897 APTIC NO. 42452

Higgins, Gary H.

BENEFITS AND RISKS FROM CONVENTIONAL AND NUCLEAR COPPER MINING. *In: Risks vs Benefit: Solution or Dream. Los Alamos Scientific Lab., N. Mex., Rept. UC-41, UC-80, p. 22-31, Feb. 1972. 21 refs. (Presented at the Western Interstate Nuclear Board Symposium, Los Alamos, N. Mex., Nov. 11-12, 1971.)*

NTIS: LA-4860-MS

The benefits and risks, or costs, of conventional and nuclear explosion stimulated copper production methods are tabulated. Each of the risks has been evaluated in terms of its dollar value, and the ratio of the value of the copper to the sum of the values of the risks -- benefit-risk ratio -- was derived. The major risks or environmental costs of conventional copper production are sulfur oxides, pits, tailings, mine dumps, and miner injury. Their value totals between $70-120/ton of copper produced. The major risks from nuclear explosion solution mining of copper are ground shock and radioactivity. Their value totals $5/ton of copper for an assumed population distribution within 30 miles of the mine site. For conventional copper production, the benefit- risk ratio is 9 to 14, and for nuclear production it is about 200.

23898 APTIC NO. 43159

Hoicka, John, Terry Trumbull, and Helen Scott

POLLUTION ABATEMENT AND UNEMPLOYMENT. A METHODOLOGICAL STUDY. *Inst. of Public Administration, Washington, D.C., Office of Air Programs and Office of Water Programs Contract EHS 70-126, 141p., Rept. APTD 0921, Jan. 31, 1972. 42 refs.*

NTIS: PB 207109

The small minority of plants that may reduce or cease operations, and thereby lay off employees, due to air and water pollution standards that will require them to invest in pollution abatement was investigated to determine the types of financial assistance required to avoid closure, the order of magnitude of potential unemployment, the kinds of plants affected, and ameliorative programs that might be instituted. Plants may reduce or cease operations to avoid the expense of pollution abatement because they cannot afford to pay for abatement costs (non-viable plants) or because they cannot secure a loan to cover the necessary initial outlay (viable plants). Non-viable plants are generally among the smallest and/or the most obsolescent in each industry. Commercial lending institutions may refuse loans to some potentially viable plants because they underestimate the ability of the plant to pass on the cost of abatement in the form of increased prices. A method was developed that provides estimates of plant closures and unemployment that are precise for some industries. It identifies certain industries where pollution abatement is most likely to result in unemployment. Three options are suggested for non-viable plants: no assistance, subsidies, and variances. Loans are the recommended form of assistance for viable plants. (Author summary modified)

23899 APTIC NO. 42721

Lieder, W. Donald

COST AND OTHER EFFECTS OF POLLUTION CONTROL. *Preprint, American Inst. of Chemical Engineers, New York, 18p., 1972. 21 refs. (Presented at the American Institute of Chemical Engineers, North Central Regional Meeting, Cleveland, Ohio, April 28, 1972.)*

Cost data and economic criteria indicative of the magnitude of pollution problems are presented. The amount of capital spending in the pollution control field varies among industries, and past spending is cited for the chemical, steel, and petroleum industries and electric utilities. Recent reports indicate that estimates of total capital spending in pollution control are escalating rapidly. Operating and maintaining these facilities is still another expense which must be considered and included in the overall accounting. Costs are indicated for the control of sulfur dioxide, lead-free gasoline, and automobile emissions control. Social costs of environmental action are discussed; unemployment, disease, and famine are mentioned. The fact is that the public will ultimately pay these costs, in higher taxes or higher prices.

23900 APTIC NO. 43215

Linden, Henry R.

A REASSESSMENT OF THE GAS SUPPLY AND DEMAND SITUATION. *Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers, Inc., Dallas, Tex., Soc. of Petroleum Engineers, 20p., 1971. 34 refs. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers Society of Petroleum Engineers, Annual Fall Meeting, 46th, New Orleans, La., Oct. 3-6, 1971, Paper SPE-3584.)*

Primary energy requirement forecasts are reconciled with an independent forecast of natural gas demand to arrive at a firm basis for assessing supply deficiencies. Gross additions to proved reserves in the lower 48 states are projected by means of a model of natural gas discovery and production, as well as by a simpler technique. These projections give an average range of gros additions of 15-20 Tcf through 1980 and show a decrease to an average level of about 15 Tcf in 1990 and 10 Tcf in 2000. This compares to a current need of about 35 Tcf. After allowing for reasonably optimistic projections of imports of pipeline gas from Canada and Mexico, liquefied natural gas from Africa and South America, and for pipeline transport of Alaskan gas, natural gas supply deficiencies in the lower 48 states still increase by about 1-1.5 Tcf each year beginning in 1972 to 1973. These supply deficiencies would reach about 10 Tcf in 1980, 20 Tcf in 1990, and 35 Tcf in 2000. Assuming development of commercial processes from existing technology at the fastest practical rate, synthetic pipeline gas from coal production, beginning in 1980 and reaching 5 Tcf/year in 1990, appears feasible at costs competitive with any other known sources of supplemental pipeline quality gas. (Author abstract modified)

23901 APTIC NO. 42762

McCarl, Henry N.

POLICY ALTERNATIVES FOR DEALING WITH POLLUTION AND OTHER SOCIAL COSTS ASSOCIATED WITH THE MINERAL INDUSTRIES. *Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers (AIME), New York, N. Y., p. 87-97, 1971. 10 refs.*

(Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 100th, Feb. 26--March 4, 1971.)

Social costs are the external costs borne by society rather than by the industry, household, or government creating them. Some method must be designed for reflecting the social cost of products from the mineral industries in the prices of the goods produced. Costs for controlling particulates, sulfur oxides, hydrocarbons, and carbon monoxide during 1967 are presented for various industries but it is argued that most costs are still undetermined. Alternate methods of control are discussed including tax incentives, direct subsidies, award payments, charges or fees, and regulation through permits. The best method, in the opinion of the author and other authorities, is the careful application of fees and charges for pollutants emitted to be administered by the Federal Government.

23902 APTIC NO. 42690

Schwartz, Irvin

THE HIGH COST OF POLLUTION CONTROL. *Chem. Week, 110(21):59-69, May 24, 1972.*

Pollution control costs are holding down profits in the chemical process industries, and control costs are rising by 18.5%/yr and causing the shutdown of some chemical and petrochemical plants and refineries. However, they have led to increased production, improvements in quality, and lower operating costs at some plants. According to McGraw-Hill Inc., as of January 1972, the petroleum industry must spend $2.69 billion simply to meet existing pollution control standards; actual spending in 1971 totaled $527 million, and planned outlays for 1972 and 1975 will total, respectively, $542 million and $462 million. Results of the Council on Environmental Quality study of the economic impact of pollution control measures on the pulp and paper, aluminum, copper smelting, lead, and petroleum industries are summarized. Specific chemical industry pollution expenditures and plant closings are reported. A study by Chase Econometrics Associates, concerning the effect of pollution control measures on the U. S. economy in general, indicated that implementing existing laws for pollution control standards will require price increases of an additional 0.25%/yr during the next 10 years, or the rate of unemployment will rise as much as 0.25% during the same period. The Chase data indicate that substantial monetary and fiscal stimulus from the government will be needed to return the economy to the base line situation for GNP, price index, and fixed business investment.

STANDARDS AND CRITERIA

23903 APTIC NO. 42659

Committee for Environmental Standards Concerning NOx, etc. (Japan)

TECHNICAL COMMITTEE REPORT ON ENVIRONMENTAL STANDARDS CONCERNING NOX. *(Chisso sankabutsu to ni kakaru kankyo kijun ni tsuiteno senmon iinkai hokoku). Text in Japanese. Japan Environmental Agency, Central Pollution Control Council, 13p., June 20, 1972.*

The measuring methods of nitrogen dioxide and photochemical oxidant are reviewed, as well as effects of these pollutants on humans in order to come up with control criteria. Air sampling should be made at an altitude ranging from 1.5 m to 10 m or less. It is also necessary to measure NO2 at the same place where the photochemical oxidant is measured, since the measured value of photochemical oxidant has to be corrected taking into account nitrogen oxides present. Continuous measurement is desirable with the measured values indicated on per-hour basis; generally, the measuring instrument is considered suitable if capable of measuring NO2 value ranging from a few ppb to 2 ppm. Although not much is known about nitric oxide as yet, it is also advisable to measure NO with NO2. The standard measuring method recommended here is an absorption photometric method using a Saltzman reagent. Continuous measurement of oxidant is desired with one-hour value representation. A suitable analyzer should be able to measure the value ranging from a few ppb to 1 ppm. An absorption photometric method using a neutral potassium iodide solution is recommended as the standard, although coulometry or the like may be used only if capable of giving equivalent performance. Effects of NOx and photochemical oxidant were discussed at some length. Adverse effects of NOx to man in conjunction with sulfur dioxide should be considered.

23904 APTIC NO. 42847

MISSOURI AIR QUALITY STANDARDS. MISSOURI EFFLUENT STANDARDS. *Ind. Develop., 141(3):24-27, May/June 1972.*

Missouri air quality standards are presented for the St. Louis and Kansas City Metropolitan Areas, as well as for the Springfield Greene County area and outstate Missouri. Concentrations not to be exceeded and the measuring interval for which they apply are indicated for sulfation, sulfur dioxide, suspended sulfate, sulfuric acid, hydrogen sulfide, oxidants, dustfall, suspended particulates, and soiling index. Emission limits are cited for particulate matter from fuel-burning equipment used for indirect heating and industrial processes. Limits are also indicated for visible emissions, sulfur compounds, sulfur dioxide, odors, and incinerator emissions. Guidelines are presented for effluents discharged into Missouri waters. Trace metals, pH, toxic substances, radioactivity, biological oxygen demand, and other parameters are included.

23905 APTIC NO. 42848

MINNESOTA AIR QUALITY STANDARDS. MINNESOTA WATER QUALITY STANDARDS. *Ind. Develop., 141(3):20-23, May/June 1972.*

Concentrations not to be exceeded of hydrogen sulfide, photochemical oxidants, carbon monoxide, hydrocarbons, sulfur oxides, particulate matter, and nitrogen oxides are indicated for Minnesota, including the measuring interval for which they pertain. Maximum allowable emissions are cited for fuel-burning equipment used for indirect heating, and particulate matter emission limits are indicated for incinerators and industrial processes. Limits are also presented for odors, visible emissions, sulfuric acid emissions, and nitric acid emissions. Minnesota water quality standards are indicated for domestic consumption, fisheries and recreation, industrial consumption, agriculture and wildlife, and navigation and waste disposal. Trace metals, turbidity value, color value, threshold odor value, pH, biochemical oxygen demand, and other effluent standards are included.

23906 APTIC NO. 42849

NEBRASKA AIR QUALITY STANDARDS. NEBRASKA WATER QUALITY STANDARDS. *Ind. Develop., 141(3):28-29, Ind. Develop., May/June 1972. 1 ref.*

Air and water quality standards and emission limits are presented for Nebraska. Particulate matter, sulfur compounds, visible emissions, and nitrogen oxides are included. Water classifications are indicated. Coliforms, dissolved oxygen, pH, taste and odor producing substances, solids, toxic substances, temperature, oil and floating substances, and aesthetic considerations applicable to water quality are included.

23907 APTIC NO. 42850

KANSAS AIR QUALITY STANDARDS. KANSAS WATER QUALITY STANDARDS. *Ind. Develop., 141(3):17-19, May/June 1972.*

Kansas air quality standards are presented for particulates, sulfur compounds, hydrocarbon emissions, carbon monoxide, nitrogen oxides, visible emissions, and fugitive dusts. Reference is made to the industrial source from which these pollutants are usually emitted. Indirect heating equipment and incinerator emissions are also included. Water quality standards are presented for bacteria, temperature, pH, oil and grease, solids, turbidity, taste and odor producing substances, color, and dissolved oxygen. Particular creeks and rivers in Kansas are mentioned.

23908 APTIC NO. 42851

SOUTH DAKOTA AIR QUALITY STANDARDS. *Ind. Develop., 141(3):32, May/June 1972.*

Concentrations not to be exceeded in South Dakota and the measuring interval for which they apply are indicated for sulfur oxides, total suspended particulates, haze, carbon monoxide, photochemical oxidants, hydrocarbons, and nitrogen oxides. Limits are also indicated for visible emissions, incinerators, fuel burning equipment, particulate matter from manufacturing processes, sulfur compounds, and nitrogen oxides.

23909 APTIC NO. 43378

IOWA AIR QUALITY STANDARDS. *Ind. Develop., 141(3):15, May/June 1972.*

The allowable rate of particulate emission, based on process weight rate, is presented for Iowa. Emissions may not equal or exceed No. 2 on the Ringelmann Chart, or 40% opacity, except during maintenance operations, when emissions may exceed this for a period totaling not more than 6 min/hr. After January 1975, the maximum 2-hr average for sulfur dioxide emissions may not exceed 5 lbs/ million BTU of heat input for any solid fuel-burning installation, nor exceed 1.5 lbs/million BTU of heat input for liquid fuel burning installations. The emission of SO2 from a sulfuric acid manufacturing plant may not exceed 6.5 lbs/ton of 100% H2SO4 produced.

23910 APTIC NO. 43433

ON SPECIFICATIONS REGARDING THE LIMITATION OF THE EMISSIONS FROM WANKEL ENGINE-EQUIPPED AUTOMOBILES. *(Foreskrifter om begransning av luftfororeningar genom avgaser fran bil med Wankel-motor). Text in Swedish. Communications Dept., Stockholm (Sweden), Guidance Group Concerning Development Work in the Field of Motor Vehicle Exhaust Gas, 3p., April 15, 1970.*

Problems involved in establishing appropriate standards on Wankel engine emission with regard to a 1968 Swedish standard limited to conventional gasoline engines with a minimum cylinder volume of 0.8 l are outlined. To make emission standards applicable also to Wankel engines, comparisons between the latter and conventional engines should be based on power output rather than on cylinder volume, since the exhaust volume is largely a function of power output. A lower limit of applicability of the automotive emission standard should be determined for an engine output, expressed in hp DIN, which can be produced by conventional engines with 0.8 l cylinder volume. This recommended lower limit was about 30 hp. The relationship between cylinder volume and power output for various small engine designs is given.

23911 APTIC NO. 43576

National Fire Protection Assoc., Boston, Mass.

REMOVAL OF SMOKE AND GREASE-LADEN VAPORS FROM COMMERCIAL COOKING EQUIPMENT. *NFPA 96, 5M-1-72-FP-WIN, 16p., 1971.*

Basic requirements for the design, installation, and use of exhaust system components for commercial cooking equipment are outlined. Included are hoods, grease-removal devices, exhaust ducts, dampers, air-moving devices, auxiliary equipment, and fire-extinguishing equipment. Methods for providing adequate ventilation for cooking equipment and for cleaning duct systems are suggested. The standards apply to industrial and institutional as well as commercial restaurants.

23912 APTIC NO. 43631

Underwriters Labs., Inc.

STANDARD FOR SAFETY. HIGH EFFICIENCY, PARTICULATE, AIR FILTER UNITS. *No. UL-586, 12p., July 14, 1971.*

A standard is presented covering the basic requirements for the performance of high efficiency, particulate, air filter units intended for the removal of very fine particulate matter from the air of industrial and laboratory exhaust and ventilating systems. Sizes, materials, efficiency, test apparatus, equipment for the measurement of penetration, equipment for factory determination of efficiency, and tests are indicated. The DOP penetration test, moist air test, heated air test, spot flame test, and low temperature test are included. Test by the manufacturer and marketing are mentioned.

23913 APTIC NO. 43312

Caretto, L. S. and R. F. Sawyer

THE ASSIGNMENT OF RESPONSIBILITY FOR AIR POLLUTION. *Preprint, Society of Automotive Engineers, Inc., New York, 7p., 1972. 12 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1972, Paper 720165.)*

A simple method of weighting emissions data to provide a relation between source mass emissions and the resulting impact on air pollution is proposed. The importance of the following factors are considered: chemical severity of the pollutant species, source effectiveness, population exposure, and area severity. The selection of these factors is described with particular attention to the obtaining of chemical severity factors from air quality standards. Qualifications upon the use of this weighting scheme are outlined. Application to the Los Angeles and San Francisco Bay areas show that weighted emissions of transportation sources are less than their mass emissions, while weighted emissions of all other pollutant sources are greater than their mass emissions. In both cases, transportation remains the dominant pollution source category. Air quality standards are given for carbon monoxide, oxidant, particulates, sulfur dioxide, nitrogen dioxide, hydrocarbons, and lead for California and the U. S.

23914 APTIC NO. 42400

Coons, Joseph D.

INSTRUMENTAL STANDARDS FOR VISIBLE EMISSIONS REGULATIONS. *Chemosphere, 1(3):103-106, May 1972. 12 refs.*

Most current standards regulating visible emissions are inherently subjective, relying upon an observer's evaluation of a comparative shade of gray against the Ringelmann Chart or the obscuration of the observer's view in comparison to some shade of gray-black smoke. Evaluations under such standards inevitably include some factors of the total visual environment which are not intrinsic properties of the emissions themselves. Plume opacity, taken as the fraction of incident light intensity lost in passage through the plume, has been used as an objective characteristic of plumes for administrative and training purposes, as well as in efforts to develop correlations between plume opacity and aerosol properties. Curves are presented which illustrate that it is possible in principle, by a proper choice of the transmittance and an exponent of the normalized diameter in specifying the pathlength over which the transmittance must be maintained, to design an instrumental standard for visible emissions in terms of real goals and capabilities.

23915 APTIC NO. 43552

Cross, Frank L., Jr.

HOW ONE STATE SET AIR POLLUTION STANDARDS FOR ASPHALT PLANTS. *Roads Streets, 1965:132-133, 136, 138, 140, June 1965. 8 refs.*

From a visit to numerous locations in Florida to learn more on existing problems concerned with asphalt plants, the major sources of concern were: storage piles, unenclosed elevators, asphalt heating boilers, yard dust, dryer discharge stacks, unenclosed vibrating sizing screens, and sulfur gases from burning of fuel oil in the dryer burner. The main concern is the discharge of smoke and particulates from the dryer stack. Two types of plants were of concern; one was the gypsy or portable plant traveling around the state to various job locations and staying from 30-60 days or longer, while the other type is the fixed or stationary plant. Two ways to control portable asphalt plants include a buffer zone and a scrubber in addition to cyclone collectors. A high volume sampling study was undertaken to validate calculations using the Gaussian diffusion equations to determine what dust concentrations might be expected downwind of the Florida Four Construction Company s portable asphalt plant near Alachua. Standards which have now been written in the new draft of the State Sanitary Code for air pollution based on these studies of portable asphalt plants are considered.

23916 APTIC NO. 42972

Johnson, Kenneth L.

IMPLEMENTING THE 1970 CLEAN AIR ACT: THE FEDERAL ROLE IN AIR POLLUTION CONTROL. *Preprint, American Inst. of Chemical Engineers, New York, 10p., 1971. (Presented at the American Institute of Chemical Engineers, National Meeting, 70th, Atlantic City, N. J., Sept. 1, 1971.)*

Sections 109, 110, and 111 of the 1970 Clean Air Act are discussed and the proposed national primary and secondary air quality standards for several pollutants are given. The primary ambient air quality standards for sulfur dioxide are 80 micrograms/cu m as the arithmetic mean and a maximum 24-hour concentration of 365 micrograms/cu m. The secondary standards are 60 micrograms/cu m annual arithmetic mean; 260 micrograms/cu m maximum 24-hour concentration; and 1300 micrograms/cu m maximum 3-hour concentration. The primary air quality standards for particulates are 75 micrograms/cu m as the annual geometric mean and 260 micrograms as the maximum 24-hour concentration. The secondary standards are 60 micrograms/cu m as the annual geometric mean and 150 micrograms/cu m as the maximum 24-hour concentration. The primary and secondary standards for carbon monoxide are 10 mg/cu m as the maximum 8-hour concentration and 40 mg/cu m as the maximum 1-hour concentration, respectively. A maximum 1-hour concentration of 160 micrograms/cu m has been established for photochemical oxidants. A maximum 3-hour concentration of 160 micrograms/cu m has been set for hydrocarbons. The annual arithmetic mean for nitrogen dioxide is 100 micrograms/cu m. Section 110, concerning plans for implementing, maintaining, and enforcing these standards, is summarized. The points that must be included in any plan before it can be approved are given. Federal stationary source control provisions are summarized.

23917 APTIC NO. 43685

Kamens, Richard M. and Arthur C. Stern

THE EFFECT OF THE INCLUSION OR EXCLUSION OF METHANE IN THE MEASUREMENT OF HYDROCARBONS ON THE 1975 MOTOR VEHICLE EMISSION STANDARD FOR HYDROCARBONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1972. 32 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-180.)*

Differences in the evolution of the measurement of hydrocarbons in the atmosphere and in motor vehicle emissions have resulted in the present situation in which atmospheric concentrations of hydrocarbons and the National Air Quality Standards for Hydrocarbons are reported on a nonmethane (excluding methane) basis, whereas motor vehicle emission concentrations are reported on a total hydrocarbon (including methane) basis. These differences in measurement technology; the reasons for their having arisen; and the influence of these differences upon the setting of the 90% hydrocarbon requirement of the Clean Air Amendments of 1970 and upon the Environmental Protection Agency 1975 Motor Vehicle Emission Standard for Hydrocarbons are discussed. The 1975 Motor Vehicle Emission Standard for Hydrocarbons should reflect only the nonmethane portion of the total hydrocarbon emissions, and a possible method for developing these standards is given. (Author abstract modified)

23918 APTIC NO. 43504

McCabe, Louis C., A. H. Rose, W. J. Hamming, and F. H. Viets

DUST AND FUME STANDARDS. *Ind. Eng. Chem., 41(11):2388-2390, Nov. 1949. 4 refs.*

The average weight of the hourly charge of materials used in a process determines the amount of dusts and fumes that may be released from stacks in Los Angeles County. Data from nonferrous, steel, gray iron, and electric iron industries were used in developing the mass-rate standard which has been in use since March 1949. The average collecting efficiency required of small industrial units is approximately 80% and for large industrial plants, approximately 90% of the average maximum loss, as determined by hourly process weights. Process weight is the total weight of all materials used in the process, excluding air, gas, and oil, but including solid fuels. Maximum hourly discharge is the maximum mass rate of discharge of solid material in a single hour during the process cycle and is expressed as a percentage of the process weight per hour. Derivation curves for the allowable discharge are presented. Only the largest process unit having a 3% loss would be required to collect 98% of its stack discharge.

23919 APTIC NO. 42964

Mortstedt, S.-E.

GASOLINE-POWERED AUTOMOBILE EXHAUST EMISSIONS AS LIMITED BY U. S. LAW. *(Avgasutslappet fran bensinbilar enligt USA-lag). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-20, 10p., Sept. 2, 1968. 2 refs.*

Limit values for carbon monoxide and hydrocarbons from gasoline engine vehicles as specified for 1968 and 1969 as well as 1970 and later car models in the U.S.A. are discussed. The CO and hydrocarbon limit values specified for 1968 and 1969 car models as a function of the stroke volume and irrespective of the weight of the vehicle are 1.5% for stroke volumes exceeding 140 cu in., 2.0% for 100-140 cu in. and 2.3% for 50-100 cu in., as well as 275, 350, and 410 ppm of hydrocarbons. The CO and hydrocarbon limits, specified for 1970 and later car models independently of stroke volume and vehicle weight are 23 and 2.2 g/mi, respectively. A comparison of the two different specifications shows lowered limits for increasing vehicle weight.

23920 APTIC NO. 43466

Ruckelshaus, William D.

DEVELOPMENT OF SYSTEMS TO ATTAIN ESTABLISHED MOTOR VEHICLE AND ENGINE EMISSION STANDARDS. *Environmental Protection Agency, Washington, D. C., Report to the 92nd Congress of the United States in compliance with Public Law 90-148 the Clean Air Act, as Amended, 83p., Sept. 24, 1971.*

The involvement of the Environmental Protection Agency in programs and activities for the control of motor vehicle emissions is described. The history of state and Federal standards and of significant EPA actions from January through June 1971 is outlined. Currently the EPA is doing work in the following areas: establishing standards, testing and enforcement of standards, monitoring technological developments, studying the feasibility of meeting required emissions standards, researching the economic impact of curtailing or eliminating the use of lead in gasoline and the feasibility of alternative engine systems, and administering the Federal Clean Car Incentive Program and the Low-Emission Vehicles Purchase Program. Emission control techniques, under development by industry for gasoline-fueled motor vehicles are reviewed. They include modification of combustion chamber design; modification of induction carburetor, choke, and ignition systems; lower compression ratio; air injection; exhaust gas recirculation; thermal reactors; afterburners; and catalytic converters. Costs of attaining the 1975 and 1976 standards and the health and welfare effects of various pollutants are discussed briefly.

23921 APTIC NO. 43599

Ruckelshaus, William D.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. PROPOSED STANDARDS FOR ASBESTOS, BERYLLIUM, MERCURY. *Federal Register, 36(234):23239-23256, Dec. 7, 1971. 34 refs.*

Pursuant to section 112 of the Clear Air Act, proposed emission standards for asbestos, beryllium, and mercury are published. Asbestos emissions to the atmosphere from mines, mills, fabricating or manufacturing facilities, demolition or repairing, spraying, or surfacing of roadways are limited or prohibited. Beryllium emissions to the atmosphere are limited to 10 g/day or an outplant concentration of 0.1 microgram/cu m of air, averaged over 30 days. Emissions of beryllium at rocket test sites shall not exceed 75 microgram min/cu m of air within 10-60 min, accumulated during any two consecutive weeks, or, if combustion products are fired into a closed tank, emissions from the tank shall not exceed 2 g/hr and a maximum of 10 g/day. Mercury emissions to the atmosphere shall not exceed 2,300 g mercury/24 hr (5.0 lb/24 hr). Methods and procedures for testing are defined.

23922 APTIC NO. 43503

Schwarz, Karl

PLANNING AND ECONOMY OF STEAM POWER PLANTS AS AFFECTED BY NEIGHBORHOOD PROTECTION. PART 2. NOISE CONTROL. *(Einfluss des Nachbarschutzes auf Planung, Betrieb und Wirtschaftlichkeit von Dampfkraftwerken. Teil 2. Laermabwehr). Text in German. Tech. Ueberwach. (Duesseldorf), 12(5):148-149, May 1971.*

Noise abatement problems to be considered in planning thermal power plants are reviewed with regard to noise standards and specifications issued recently. While standard values must not be exceeded except in single cases of emergency, all available technical possibilities to abate noise must be applied regardless of the below-standard noise level thus reached. Standard values for recreational, residential, mixed, and industrial areas are specified separately for day and night. Noise intensity measurements should be made 3 m off industrial premises or 0.5 m off an open window of the nearest dwelling-house. Requirements of neighborhood protection should be considered in siting and planning power plants and their equipment as well as in designing soundproofing of constructions. Special attention should be paid to gates and windows susceptible of producing major noise emissions. General instructions to be followed when siting and designing steam generators, turbine sets, and auxiliary equipment are reviewed.

23923 APTIC NO. 42898

Sherwood, R. J.

THE MONITORING OF BENZENE EXPOSURE BY AIR SAMPLING. *Am. Ind. Hyg. Assoc. J., 32(12):840-846, Dec. 1971. 22 refs.*

The practical difficulties found in the application of a ceiling limitation to the threshold limit for benzene, a chronic poison, leads to the proposal that threshold limit values for acute and chronic exposure be separately assessed. By introducing the concept of a permitted day s exposure based on a time-weighted average threshold limit of 10 ppm, it appears that both acute and chronic hazards can be controlled by a single limit of 5000 ppm-minutes. Air samplers to provide warning of acute overexposure could be constructed, and long-period personal air samplers will provide adequate information on which to assess the chronic hazard. As the introduction of this single criterion would greatly simplify monitoring exposure, it is hoped that toxicologists will consider its acceptability. (Author conclusions modified)

23924 APTIC NO. 42830

Stokinger, H. E.

SANITY IN RESEARCH AND EVALUATION OF ENVIRONMENTAL HEALTH. *Science 174(4010):662-665, Nov. 1971. 24 refs.*

Criteria and standards for judging environmental pollution must be based on clear scientific evidence. In the case of air pollutants, scientific facts for each of the multiple criteria must be carefully developed and assessed before air quality standards are proposed. Furthermore, all standards, guides, limits, and the criteria on which they are based should be completely documented and that documentation made available to the public. Realistic dosage-response relationships should be established. Dosage levels should bracket the national average concentration of a particular pollutant by at least one logarithmic decrement and two logarithmic increments. Unnecessarily severe standards should be avoided, particularly for air pollution where cost of control can be disastrous to industry, especially those standards not strictly related to health, e.g., particulates and sulfur dioxide. Official action to ban distribution and consumption of industrial commodities on the basis of newly discovered environmental levels should not be made without the perspective afforded by comparison with past environmental levels. The banning of DDT and alkyl mercury compounds could precipitate a serious world health problem. Instead of wholesale banning, limited use should be permitted by a procedure of licensing and provisions for restricted use. The prospect of economic upheaval must be taken into consideration in anti-pollution efforts.

LEGAL AND ADMINISTRATIVE

23925 APTIC NO. 42334

ARE ANTI-POLLUTION EFFORTS DOOMING THE CONV [illegible] 'ER IN NEW JERSEY? Flexography, 17(2):18, 20, 34- [illegible] eb. 1972.

The New Jersey Department of Environmental Protection held public hearings in Trenton on Jan. 6-7, 1972. At issue were proposed amendments to several chapters of the New Jersey Air Pollution Control Code. Representatives of the flexographic industry expressed the belief that if Chapter 16 of the Code: Control and Prohibition of Air Pollution from Volatile Organic Substances, is adopted as written, New Jersey converters will have to shut down or move due to the high costs of high temperature incineration needed to comply with the proposed regulations.

23926 APTIC NO. 42453

New Jersey State Dept. of Health, Trenton, N. J., Air Pollution Control Program

EMERGENCY CONTROL ACT, P.L. 1967, C. 108 (TITLE 26, 2C:26-36) SUPPLEMENTS AIR POLLUTION CONTROL ACT (P.L. 1954, C.212). *1p., March 1970.*

The New Jersey Emergency Control Act allows the State Commissioner of Health or his delegate to request the Governor to issue a proclamation of air pollution emergency. The Governor, upon making this proclamation, has the power to control emission of air pollutants in the area of concern by prohibiting motor vehicle travel, controlling manufactures, controlling incinerator use, and prohibiting, restricting, or conditioning any and all activities that contribute or may contribute to the air pollution emergency. The Act grants permission to enter all property except single and two-family dwellings in order to require compliance, and establishes the limit of punishment for persons or firms who interfere with the work of compliance at $100,000 or 10-year imprisonment or both. The Act allows for public hearings and appeals and the promulgation of a set of stanby orders to go into effect during an emergency.

23927 APTIC NO. 42457

New Jersey Dept. of Environmental Protection, Bureau of Air Pollution Control

SOME FACTS ABOUT AIR POLLUTION CONTROL IN NEW JERSEY. *1p., 1972 (?).*

The New Jersey Air Pollution Control Act (1954) gives the Department of Environmental Protection the power to formulate and promulgate, amend and repeal codes, rules, and regulations preventing, controlling, and prohibiting air pollution. Basic statutes include the Law on Permits, the Air Pollution Emergency Control Act, the Motor Vehicle Law, the Tax Exemption Law for certain air and water pollution control equipment, and the Scholarship and Intern Law for graduate and undergraduate study. Fifteen chapters of the New Jersey Air Pollution Control Code are in effect, dealing with open burning, smoke, fly ash, emissions of solid particles and sulfur compounds, sulfur content of fuels, incineration, and smoke from diesel-powered vehicles. During 1971, the Enforcement Section of the Bureau of Air Pollution Control issued 1117 orders to cease specific violations of the code. Of these, 915 were for violation of the incinerator, open burning, permit, and smoke codes. Notices of prosecution were sent to 307 persons, 115 cases were referred to the Attorney General, and 17 court actions were held. Fines collected amounted to $236,150. Seventy-six communities in the state have ordinances approved by the Department. The State Implementation Plan indicated that sulfur dioxide primary standards will be, and secondary standards, should be met by 1977; particulates primary standards will be met by 1975, but secondary standards may be unachievable; carbon monoxide and photochemical oxidant standards will be met by 1977; hydrocarbons and nitrogen dioxide standards will not be met.

23928 APTIC NO. 42603

AIR AND NOISE. *(Luft und Laerm). Text in German. In: Umweltschutz. Das Umweltprogramm der Bundesregierung. Stuttgart, W. Kohlhammer GmbH, 1972. p. 138-169.*

The air pollution control program set up as a part of a general environmental protection program in West Germany is described. Air pollution involves health hazards, particularly in the form of heart and circulation troubles, and corrosion hazards. The basic pollutants are carbon monoxide, nitrogen and sulfur oxides, fluorine compounds, heavy metals, dust, and odorous substances. Clean air maintenance plans will be elaborated and monitoring and smog alarm systems will be set up. Problems of clean air maintenance in industrial and domestic sectors are outlined. Dust, sulfur dioxide, nitrogen oxides, and hydrocarbons are the chief pollutants emitted from industrial and domestic sources. While the proportion of coarse dust emissions has abated, that of fine dust has increased for the past years. The use of raw materials and fuel, as well as technologies and equipment involving minimum pollution hazards, and of proper pollution control devices and the proper choice of industrial sites are the basic means of controlling air pollution. Emission standards for dust, soot, SO2, nitrogen oxides, CO, hydrocarbons, and fluorine and chlorine compounds will be established or existing standards will be lowered. The content of harmful components in automotive exhaust (CO, hydrocarbons, nitrogen oxides, and lead) will be reduced to one tenth the 1969 level by 1980. The CO and hydrocarbon emissions have already been limited, while the maximum lead content in gasoline, set at 0.4 g/l in 1972, will be further lowered to 0.15 g/l in 1976. Proper maintenance and adjustment of the ignition system and the carburetor result in 20% reduction in CO emissions. New types of drive are being studied.

23929 APTIC NO. 42610

Japan Chamber of Commerce, Tokyo, Bureau of Industrial Pollution Information

REPORT ON ACTIVITIES OF BUREAU OF INDUSTRIAL POLLUTION INFORMATION (MARCH 1972). *(Sangyo Kogai sodanshitsu jigyo hokokusho (Showa 47 nen 3 gatsu)). Text in Japanese. 46p., 1972.*

In March 1972, 599 cases concerning environmental pollution were handled at the 27 offices of the Japanese Chamber of Commerce, including 107 cases on air pollution. An additional 144 field technical consultations at 108 companies were performed. The cases on air pollution included improvements of stacks and heavy oil combustion upon construction of a new boiler; simple and low cost methods for the treatment of waste water from particulate washing towers for the cupola furnace; and regulations on particulate control and the control of hydrogen chloride gas from a new facility. Twenty-five lectures were also held all over the country.

23930 APTIC NO. 42709

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE METROPOLITAN SAN ANTONIO INTRASTATE AIR QUALITY CONTROL REGION (TEXAS). *APTD-1090, 43p., Oct. 1969. 8 refs.*

NTIS: PB 209779

A report for consultation on the Metropolitan San Antonio intrastate air quality control region indicates that at the present time the major pollutant point sources are located in Bexar, Comal, and Guadalupe counties. Receptors in these counties are also shown to be experiencing the major air pollution problems. The three counties in the proposed Region are also expected to register the greatest population growth of the eight study area counties in the next few decades. The emission inventory performed employed the Rapid Survey Technique for Estimating Community Air Pollutant Emissions. This technique provided estimates of the total emissions for the following five pollutants: sulfur oxides; nitrogen oxides; hydrocarbons; carbon monoxide; and particulate matter. Sulfur oxides, total particulates, and carbon monoxide are specifically considered since they provide an indication of the geographic extent of the air pollution problem.

23931 APTIC NO. 42852

AGRI-INDUSTRY BRINGS POLLUTION PROBLEMS TO THE GREAT PLAINS. *Ind. Develop., 141(3):14, May/June 1972.*

Run-off from agricultural land is undoubtedly the largest and most complex pollution problem in the Great Plains states. Leaching of such nutrients as nitrogen and phosphorus from fertilized fields, drainage from barnyards and feedlots, flows of irrigation return waters into surface drainages, introduction of herbicides and pesticides, and siltation from agricultural lands all combine to produce a major water pollution problem. Control agencies are listed for Iowa, Kansas, Minnesota, Missouri, North Dakota, South Dakota, and Nebraska. Permits, penalties for noncompliance, and control incentives are also indicated for the Great Plains states.

23932 *APTIC NO. 42867*

Japan Environmental Agency

***RELIEF FOR VICTIMS OF AIR POLLUTION DISEASES.** In: Pollution Related Diseases and Relief Measures in Japan. p. 23-25, May 1972.*

Pollution related diseases and judicial and medical relief measures in Japan are discussed. The designated respiratory diseases include chronic bronchitis, bronchial asthma, pulmonary emphysema, and asthmatic bronchitis. Legislation of relief measures and costs of relief are reviewed. Specific medical benefits and expenses are listed.

23933 APTIC NO. 42873

AIR POLLUTION PROBLEMS. *(Problem der Luftverschmutzung). Text in German. In: Bericht der Bundesrepublik Deutschland ueber die Umwelt des Menschen. p. 53-61, May 1972.*

Problems of and measures planned in West Germany to control air pollution are outlined. Air pollution, particularly due to carbon monoxide, sulfur and nitrogen oxides, fluorine, heavy metals, dust, and odors, represent health and corrosion hazards. Model experiments to elaborate adequate pollution abatement measures have been carried out. Clean air maintenance plans, including regional programs, the set-up and extension of monitoring networks, the use of low-emission raw materials, fuels, technologies, equipment, dust separators, gas cleaning equipment, and high stacks will be the basic means of abating air pollution. Further pollution standards, implying limitations on fuel sulfur content, will be introduced. Partial desulfurization of fuel and Diesel oil has been applied. The emissions from Otto engined vehicles will be successively reduced to 1/10 of the 1969 level by 1980. Carbon monoxide and hydrocarbon emissions have been limited as a first step, followed by a lead emission standard in 1971, requiring a maximum concentration of 0.4 g/l which will be further reduced to 0.15 g/l in 1976. As the possibilities to control emissions from conventional engines are limited, studies on new power sources are promoted. Radioactivity as created by human activity is negligible in comparison with the background level.

23934 APTIC NO. 42874

AIR POLLUTION CONTROL POLITICS. *(Immissionsschutzpolitik). Text in German. In: Bericht der Bundesrepublik Deutschland ueber die Umwelt des Menschen. p. 67-92, May 1972.*

Tasks of the different lands in connection with the Clean Air Act, emitted Aug. 1971, as well as short and long-term programs are outlined. The basic activity of the land will lie in enforcement, set-up of expert teams, authorities, and institutions, as well as in the elaboration of regional standards. In Baden-Wuerttemberg, where dust, sulfur and nitrogen oxides, fluorine, and odors are the chief pollutants, the suppression of any further increase in the emissions is a long-term objective. Domestic heating and traffic are the main problems in West Berlin. Continuous air quality monitoring regarding fluorine, hydrocarbons, odorous substances, dust, sulfur and nitrogen oxides, hydrochloric acid, and oxidants is carried out in highly industrialized Northrhine Westphalia where increases in nuclear energy output and intensive growth of the chemical industry are the basic trends. Abating emissions levels, particularly in the Ruhr area, is the long-term goal to be reached, and emissions from 100 large industrial plants will have to be eliminated or reduced by 1975. Comprehensive air pollution measuring programs are run in Saarland. Measures planned in air pollution, noise and radioactivity control areas in other lands are reviewed.

23935 APTIC NO. 42875

SPACE PLANNING. *(Raumordnung). Text in German. In: Bericht der Bundesrepublik Deutschland ueber die Umwelt des Menschen. p. 134- 142, May 1972.*

Problems of space planning as well as future trends in urban and rural development are outlined with regard to environmental protection. Some 50% of the population now live in highly industrialized areas with high population density, and further increases are likely. While environmental protection can be more efficient in new than in existing residential areas, the latter are exposed to several nuisances due to smoke, dust, gases and noise, for example. Most of the new problems are expected to develop in areas where environmental problems are already acute. Appropriate arrangement of residential, industrial, and business areas, noise and exhaust control, promotion of public transportation, consideration of the ecologic performance in space use as well as the establishment of recreational areas near urban zones are the basic objectives of space planning. The present situation is being surveyed and a global space planning program, considering environment quality criteria, is being set up.

23936 APTIC NO. 42876

ENVIRONMENTAL PROBLEMS INVOLVED IN CITY PLANNING AND HOUSING. *(Umweltprobleme in Staedtebau und Wohnungswesen). Text in German. In: Bericht der Bundesrepublik Deutschland ueber die Umwelt des Menschen. p. 143-155, May 1972.*

Environmental problems involved in city planning as well as related regulations and objectives are outlined. As more and more industries leave cities, service facilities appear, while this trend is slower and less apparent in country towns. Deficiencies in city planning, obsolete, poorly functioning center cities, the interference of residential with industrial zones, nuisances due to noise, pollution, and vibration, disturbances in the ecological equilibrium and buildings failing to meet hygienic requirements are the basic features of existing cities. Studies of city planning methods, the theory of city structures with a minimum of environmental problems, and sociological problems are the first link of long-range measures to be taken. Long-term programs including studies on the maintenance of the ecological system, and the influence of urban and industrial areas and traffic on environment quality will be set up.

23937 APTIC NO. 42877

EDUCATION AND INTERNATIONAL COOPERATION IN THE PROTECTION OF THE ENVIRONMENT. *(Bildung und Ausbildung. Erforderliche Internationale Zusammenarbeit). Text in German. In: Bericht der Bunderserepublik Deutschland ueber die Umwelt des Menschen. p. 156-159, May 1972.*

Problems of education in matters of environmental protection, as well as of international cooperation, with special regard to the technological assistance offered to underdeveloped countries, are outlined. Environmental protection knowledge should be integrated in high school and college curricula, and adequate additional and refresher courses should be organized. Environment-consciousness should be set as a general goal in education. International cooperation should include international agreements concerning environmental protection, unification of standards and criteria, coordinated or joint research and development, as well as exchanges of experience. Environmental management and protection should be pursued in close cooperation with underdeveloped countries; their respective environmental conditions and the relations between development and environment should be taken into account. Cooperation in drawing up environmental protection programs can be an integral part of the technological assistance granted to underdeveloped countries.

23938 APTIC NO. 42919

LEGISLATIVE AND ADMINISTRATIVE PROCEDURES. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 1, p. 1-11.*

The pollution of the atmosphere by smoke has long been recognized as a public nuisance in most states, and from this as a beginning has grown the present day movement for air pollution control. An analysis of early air pollution legislation discloses several important facts. First, and probably foremost, is the fact that, under common law, local communities did have the power to regulate nuisances, and therefore had some power to abate air pollution, without specific enabling acts. Secondly, it is shown that a clear, concise state enabling act may be desirable in order to permit local enforcement of comprehensive air pollution laws. The states and some of the local territories are listed with a short description of present legislation. By far the most important development in air pollution legislation is that which recognizes the fact that air pollution, by its very nature, is not confined to local geographic areas but crosses boundaries quite frequently. The powers and duties of the air pollution control agency and its director are considered, as well as board meetings, organization of the agency, and duties of the agency, and duties of the bureau of inspection.

23939 APTIC NO. 42943

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE METROPOLITAN BIRMINGHAM INTRASTATE AIR QUALITY CONTROL REGION (ALABAMA). *APTD-1092, 56p., Dec. 1969. 14 refs.*

NTIS: PB 209781

A report for consultation on the Metropolitan Birmingham intrastate air quality control region was prepared based on data representative of the year 1965 in Jefferson County. Sulfur dioxide, total particulate, and carbon monoxide emissions were broken down according to source type in four general categories: fuel combustion (stationary sources), industrial processes, solid-waste disposal, and transportation. Industrial processes, account for aproximately 68% of all sulfur dioxide emission and over 92% of the total particulate emissions in Jefferson County. Fuel combustion in industrial stationary sources also contributes significantly to the sulfur dioxide and total particulate emissions in Jefferson County. Over 92% of the carbon monoxide emitted in the survey area is attributable to gasoline powered motor vehicles. Aircraft also contribute relatively high quantities of carbon monoxide to the county total. Diffusion modeling was used to compute the ground level concentrations of pollutants at 225 receptor points. Since topography is an important factor influencing pollutant dispersion, the diffusion model should be viewed as a crude aproximation of the air pollution problem in greater Birmingham. Urban factors such as population distribution, manufacturing activity, and existing regional arrangements are also considered in the designation of an air quality control region.

23940 APTIC NO. 43165

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE LOUISVILLE INTERSTATE AIR QUALITY CONTROL REGION (INDIANA-KENTUCKY). *APTD-1094, 51p., Oct. 1969. 6 refs.*

NTIS: PB 209783

An evaluation of urban and engineering factors indicates that at least three counties should be included in the Louisville Air Quality Control Region: Jefferson, Floyd, and Clark. The evaluation of urban factors indicates that the bulk of the population in the Louisville area resides in these three counties. Jefferson County contains about 80% of the manufacturing employment of the Louisville area at the present time. During the next decade, growth of population and manufacturing employment is expected to occur primarily in Jefferson, Clark, and Floyd areas. The engineering evaluation shows that the same three counties contain essentially all of the air pollutant emissons sources in the Louisville area, and encompass most of the area affected by poor air quality resulting from those emissions. The boundaries proposed in this report for the Louisville Interstate Air Quality Control Region are a starting point for discussion with State and local officials at the scheduled consultation.

23941 APTIC NO. 43206

National Industrial Pollution Control Council, Washington, D. C., Chemicals Sub-Council

THE CHEMICAL INDUSTRY AND POLLUTION CONTROL. *31p., June 1971. 14 refs.*

GPO

Efforts of the chemical industry at air pollution abatement, water pollution abatement, and the disposal of solid wastes are reviewed. Control methods for sulfur oxides, particulates, and odor emissions include the use of low-sulfur fuel, higher stacks, absorption devices such as scrubbers, washers and absorbers, and by combustion using catalytic oxidation or direct-fired afterburners. Industrial plant treatment, municipal-industrial joint treatment, the basin commission concept, and deep well disposal are discussed in relation to water pollution abatement. Incineration and pyrolysis, barging, and the recovery and reuse of solid wastes is discussed.

23942 APTIC NO. 43239

Public Health Service, National Air Pollution Control Administration

REPORT FOR CONSULTATION ON THE METROPOLITAN DALLAS-FT. WORTH INTRASTATE AIR QUALITY CONTROL REGION (TEXAS). *APTD-1096, 45p., Oct. 1969. 7 refs.*

NTIS: PB 210122

A study of athe Dallas-Ft. Worth metropolitan area is presented. Criteria for determining regional size and procedures for designating regional boundaries are indicated. Topography, meteorology, an emission inventory, and an air quality analysis of suspended particulates, sulfur oxide levels, and carbon monoxide levels were considered. Population, industry, regional planning, air pollution control agencies, and other urban factors were evaluated. The proposed region is discussed.

23943 APTIC NO. 43283

Office of Air Programs, Research Triangle Park, N. C., Office of Research Grants

AIR POLLUTION CONTROL ACTIVE RESEARCH GRANTS FOR FISCAL YEAR 1971. *OAP Pub-APTD-0740, 55p., July 1971.*

NTIS: PB 204175

The Office of Research Grants of the Environmental Protection Agency promotes and administers a research grants program with universities and other nonprofit organizations on the causes, effects, extent, prevention, and control of air pollution with respect to human health, welfare, and productivity. The purpose of this program is to promote and encourage research and development of new concepts, methods, and equipment for the establishment of air pollution standards and more effective air pollution control. During fiscal year 1971, grants were awarded in eight major areas: human health effects, agricultural effects, socio-economic and political studies, physico-chemical investigations, development of analytical methods and equipment, meteorology, air pollution source control, and communications. These grants are listed.

23944 APTIC NO. 43508

PRINCIPAL LEGISLATIVE MEASURES IN THE GERMAN FEDERAL REPUBLIC. *(Die wichtigsten gesetzgeberischen Massnahmen in der Bundesrepublik Deutschland). Text in German. Staedtehygiene (Uelzen/Hamburg), 21(7):170-171, July 1970.*

Principal legislative measures taken in West Germany to abate air pollution are outlined. Industrial facilities susceptible of generating emissions require official authorization prior to being installed or modified. This requirement applies to all thermal equipment firing solid and liquid fuel above an output of 800,000 kcal/hr. Non-industrial and industrial facilities, not requiring authorization, are subject to limitations regarding emissions in Northrhine-Westphalia. The general abatement of smoke emissions from oil-burning equipment are the basic objectives. Temporary and local limitation of the use of cars during smog hazards in the Ruhr area may be imposed.

23945 APTIC NO. 42314

Abelson, Philip

A GEOPHYSICIST S WATCH ON THE ENVIRONMENT. *New Scientist Sci. J., 50(756):696-698, June 17, 1971. (Presented at the American Geophysical Union, National Meeting, Dec. 1970.)*

Geophysicists have important roles to play in helping society attain a liveable environment. First is their role as informed citizens. They can be cognizant of crucial facts and make informed, balanced judgements on many environmental issues. In so far as the facts are available they can be a source of information and perspective. When knowledge is lacking, they can develop it, for example, by monitoring. Geophysicists have a special role because the environment is the geophysicist s natural habitat. While it is fashionable these days to castigate man, science, and technology, as great despoilers of nature, it is necessary not to lose sight of the fact that nature herself is a great polluter. On a world-wide basis, nature places three times as much sulfur into the air as comes from industry. An important concept that is now beginning to be emphasized is a materials-balance approach. Carbon dioxide is a matter of concern because of its possible effect on global weather. In order to enforce laws against pollution it is necessary to identify the offenders and to measure the extent of their contributions. The monitoring of urban air pollution is indicated, while materials accountability is a powerful tool in the identification of polluters. The disposal of wastes and mixing in the ocean are considered, as well as the behavior of DDT.

23946 APTIC NO. 43390

Baruch, Stephen B. and Stuart N. Roth

EVALUATION OF AIR POLLUTION CONTROL AGENCY ACTIVITIES IN THE UNITED STATES - QUANTITATIVE OR QUALITATIVE? Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., 1972. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-52.)

Air pollution control programs must show their effectiveness to compete successfully for the limited amounts of public funds. Effectiveness can be measured by employing either qualitative or quantitative parameters. Historically, the use of qualitative parameters by the public in recognizing the existence of a pollution problem has led to the formation of the air pollution control agency. As monitoring technology became more sophisticated, it was possible for the agency to identify qualitatively additional pollutants of concern and to characterize these pollutants quantitatively. Refinement of monitoring and analysis equipment has allowed accurate quantification of various pollutants. This quantification has, because of lack of standardization, not allowed effective comparisons of results obtained in varying jurisdictions. The Federal government has promulgated uniform national ambient air quality standards for six pollutants, techniques for sampling and analysis of these pollutants, guidelines for strategies to achieve the standards, and emission standards for some stationary sources. This has led, and will continue to lead, to the establishment of a consistent base with which to compare agency performance on a nationwide basis. It should be realized that an action by an air pollution control agency which has, or will have, beneficial effects in a quantitative manner, will not necessarily result in the perception of a beneficial qualitative impact by the public. It is required, therefore, that a balance be maintained between quantitative and qualitative processes. (Author abstract modified)

23947 APTIC NO. 42778

Beek, W. J.

EDUCATIONAL, INFORMATIONAL, SOCIAL AND CULTURAL ASPECTS OF ENVIRONMENTAL ISSUES. *Ingenieur, 84(22):A483-A485, June 2, 1972.*

Much of what is debated under the issue of pollution is part of a national and an international apprehension which becomes manifest when too many of a growing population move into the large cities of an industrial or pre-industrial society. A careful balance of environmental control actions in the different segments of a specific society must be devised. Recommendations concerning general approaches to knowledge and research; education, teaching, and training; information; political and institutional action; and institutional implications are presented. These recommendations are compared to those of the Stockholm Conference.

23948 APTIC NO. 42811

Berlin, A. and G. Hill

THE ROLE OF THE COMMISSION OF THE EUROPEAN COMMUNITIES IN ENVIRONMENTAL AFFAIRS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., Washington, D. C., 1970, p. 1343-1345. (Dec. 6-11, Paper P2 E.)*

The Commission of the European Communities has an extensive program in the field of air pollution resulting from the application of the various Treaties reached within the European communities. The activities of the Commission relative to the fight against air pollution in mines and in the iron and steel industries result from the application of the various articles of the Coal and Steel Community (CECA) Treaty aimed at developing the production and safety, and at improving the living and working conditions of the labor force. The Treaty of Rome, which created the European Atomic Energy Community, has emphasized the health physics problems concerning the protection of the workers and the populations against ionizing radiations, and the problems of the prevention of environmental pollution by radionuclides. Three main areas presently considered by the Nuisances group, established following the resolution adopted by the Council of Ministers for Research of the Six Member States of the European Community in 1967, are pollution due to sulfur compounds, development of biological indicators of pollution, and the investigation of the products emitted into the atmosphere by motor vehicles and household heating installations.

23949 APTIC NO. 42956

Brandt, Allen D.

THE AIR POLLUTION SITUATION TODAY WITH SPECIAL REFERENCES TO CONTROL LEGISLATION. *Iron Steel Engr., 36(1):103-108, Jan. 1959. 12 refs.*

The problems that air pollution creates, the significant contamination sources in the steel industry, a philosophy to guide regulations, and current activities in the field of air pollution control legislation are discussed. Air pollutants can affect the health or well being of humans, cause injury to plants and animals, harm personal or real property, and have serious nuisance effects. Sources of contamination within the steel industry include coke ovens, sintering plants, blast furnaces, open hearths, electric furnaces, Bessemer converters, scarfing operations, and power houses. In the past too much attention was paid to air contamination control and too little to the solution of problems created by air pollution. The common regulatory approach to air pollution control appears not to be the

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best one. There is need for increased research on the effects of air pollution and new and improved methods of removing air contaminants from the gases discharged to the atmosphere. In the field of legislation, most states are using abling statutes to grant authority to local government to adopt ordinances off general or specific kinds, including air pollution control. In communities where there may be several sources contributing to a problem of air pollution, the approximate percentage contributed by each source should be determined to permit that equitable control.

23950 APTIC NO. 42869

Bujac, James N., Jr. and Raymond Mantler

IMPACT OF NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (PL91-190) ON THE ADVANCED TECHNOLOGY TURBINE ENGINE. *Naval Air Propulsion Test Center, Trenton, N. J., Proc. Natl. Conf. Environ. Effects Aircraft Propulsion Systems, Trenton, N. J., 10th, 1971, p. 26-1 to 26-19. (May 18-20.)*

A study was conducted to determine the impact of this Act upon the development of advanced Army aircraft turbine engines in terms of performance, additional cost, and added development time. Turbine engine contributions to noise, smoke, and invisible chemical pollution are evaluated, and approaches taken to minimize these effects are outlined. Previous and anticipated content of hydrocarbons, carbon monoxide, nitrogen oxides, and particulates in turbine engine emissions are summarized.

23951 APTIC NO. 42688

Callahan, Joseph M.

SIXTY MINUTES WITH RUCKELSHAUS. *Automotive Ind., 147(1):31-36, 50, July 1, 1972.*

An interview with William D. Ruckelshaus, an Environmental Protection Agency administrator, showed that the automobile industry could meet the 1975 emission standards by using second generation catalysts in their automobile systems. A two-car strategy, whereby tough control systems would be required for certain areas, and less stringent systems for other areas, was discussed. Several options for the automobile makers were listed, including continuing research, re-applying for a time extension to meet standards, contesting the decision, and changing legislation. Carbon monoxide, sulfur, and particulate emissions and the per/car cost of air pollution controls were reviewed.

23952 APTIC NO. 42981

Callahan, Joseph M.

LONDON SMOG THING OF PAST. *Automotive Ind., 144(7):40-42, April 1, 1971.*

Seventy-five percent of the air pollution in London has been eliminated, mostly be getting rid of the smoke emitted from the chimneys of coal-burning homes and factories. By contrast, the largely unproductive United States effort has compelled motorists to spend $2 billion in the last 11 years for over 90 million auto pollution control devices. Relatively inactive state governments must control emissions from coal and other serious pollutants. The London sucess was mostly achieved since 1956 when the Clean Air Act was passed, making mandatory the burning of smokeless fuels in all areas designated smokeless zones. In addition, electric power stations and factories were ordered to immediately reduce smoke to a Ringelmann No. 2 level. The industrial pollution from coal-burning was mostly eliminated by injecting the right amount of secondary air into furnaces, thus promoting more efficient, largely smoke-free combustion. The British concentrate on smoke which consists of tiny particles of black soot less than a micron in diameter, dust which is coal ash that is either light gray or brown, and grit which is the same material but may be up to 80 microns in size. London's dramatic change has resulted in an increase in average visibility from 1 1/2 miles in 1956 to 4 1/2 miles in 1971, and over 70 species of birds have returned to the area.

23953 APTIC NO. 43471

Chass, Robert L. and Edward S. Feldman

TEARS FOR JOHN DOE. *Southern Calif. Law Rev., vol. 27:349-371, 1954. 27 refs.*

The incidence and control of air pollution in Los Angeles County is described. Topographical and meteorological conditions, including wind speed and heat inversions, aggravate the effects of the pollution produced by population and industry in the Los Angeles Basin. To demonstrate the susceptibility of industrial or mining areas to disaster, several air pollution episodes are reviewed, including ones in England; Mexico; Canada; Belgium; Ducktown, Tennessee; and Donora, Pennsylvania. Dusts, fumes, smoke, peroxides, aldehydes, organic acids, sulfur dioxide, nitrogen oxides, and certain hydrocarbons are the principal ingredients of the pollution in Los Angeles. Offensive odors can generally be found in the vicinity of plants processing fertilizers, meat, fish, rubber, soap, paint, and varnish. Effects of Los Angeles smog include eye, nose, and throat irritation; vegetation damage, visibility reduction; and psychological effects. The history of Los Angeles County and California legislation for air pollution control is reviewed. The structure of the Los Angeles County Air Pollution Control District is described, including organization of the district, administration, and the divisions of office management, inspection and enforcement, engineering, and testing, development, and research. The results of pollution controls on sulfur dioxide, industrial pollutant and gasoline vapor levels, and industrial, commercial, and municipal burning are presented. Problems remaining involve refinery operations, automobile exhausts, combustible refuse, and air pollution zoning.

23954 APTIC NO. 43190

Cross, Frank L., Jr.

TRENDS IN AIR POLLUTION CONTROL REGULATIONS. *Preprint, Air Pollution Control Assoc., New England Section, 15p., 1971. (Presented at the Air Pollution Control Association, New England Section, Meeting, Cranston, R. I., Oct. 27, 1971.)*

Trends in air pollution control regulations are discussed. Regulations for solid waste disposal by incineration, batch-type asphalt plants, cement plants, power plants, sulfuric acid plants, and nitric acid plants in relation to their emissions of particulates, nitrogen oxides, and sulfur dioxide are discussed. Data obtained from tests on a municipal incinerator, from Portland cement plants, kilns and clinker coolers, and from fossil fuel fired steam generator plants are presented.

23955 APTIC NO. 42835

Daley, J. C. and E. C. Johnson

EMISSION CONTROL PROCESS SELECTION. *J. Metals, 24(7):30-34, July 1972. 3 refs.*

The difficulty of making investment decisions in the face of uncertain air standards can be eased somewhat by approaching the problem in a logical, disciplined manner. The copper smelter manager can adapt the logic of a taxonomy to the emission control selection problem, carefully classifying each feasible strategy, and thus assuring consideration of all approaches while providing a simple, visual basis for discussion of alternatives. Decision trees, now gaining wide acceptance as an investment decision-making tool, can be used to good advantage in assessing the relative economics of a variety of smelter emission control problems. The expected value of the alternative strategies takes into account capital and operating costs, revenues, timing of future events occurring, capital discount rate, and the probability of future events occurring. Problems are presented which illustrate these two techniques. (Author conclusions modified)

23956 APTIC NO. 42807

Dave, J. M.

PROBLEMS OF AIR POLLUTION CONTROL IN INDIA – A DEVELOPING COUNTRY. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1220-1224. (Dec. 6-11, Paper AD 11H.)*

India has a large amount of air pollution scattered in its industrial complexes due to a heavy concentration of emissions in eight areas and estimates an increase of 30 to 100% of industrial growth in the next five years. The total estimated emissions of major pollutants from major fuel sources for 1965-1966 was 26,030 thousand tons of particulates, organics, sulfur dioxide, carbon monoxide, nitrogen oxides, hydrogen sulfide, ammonia, and hydrogen chloride, in descending order of emission amounts. Due to a lack of awareness of the air pollution problem, no zoning or planning was done and the pollution causing industries were located haphazardly, intermixed with the residential areas. For cost purposes, much imported equipment was selected without control mechanisms, resulting in a lack of enforcement of control systems. Together with these factors, the lack of proper meterological data and absence of legal authorities have created severe air pollution problems affecting large populations in almost all Indian cities. The following are recommendations for the control or amelioration of air pollution in India: widespread distribution of industries whenever strict emission controls are not economically feasible, better planning of land use and zoning, development of training facilities to provide staff for administrative agencies for control purposes, and acceptance of help from International agencies whenever necessary.

23957 APTIC NO. 42376

Duerre, W.

CONTRIBUTION TO LIMITATION OF AIR POLLUTION CAUSED BY NON-FERROUS METAL INDUSTRY. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 744-746. 8 refs. (December 6-11, Paper EN 22E.)*

The non-ferrous metals industry accounts for emissions of great quantities of toxic substances into the atmosphere including gases, dusts, and odorous substances. Frequently occurring high concentration of these substances can poison humans, animals, and plants and can cause corrosion of physical property in addition to economic loss. In the past, research centered on useful dusts and then focused on elimination of these substances by technological means. New ways are needed to attack the pollution problem in the non-ferrous metals industry. One recent development is The Law for Maintaining the Purity of the Air, which protects technolgically clean industries against prejudice in economic competition. Another useful measure is voluntary work toward setting standards. The recycling of dusts may allow the deduction of credits from the remaining cost of air purification equipment, but this approach may present problems of mathematical calculations. Other possibilities of aid are tax relief and loans at favorable rates of interest.

23958 APTIC NO. 43549

Dunfee, Norman L.

CAREER OPPORTUNITIES IN THE PUBLIC SECTOR FOR ENVIRONMENTAL MANAGERS. *Preprint, Inst. for Management Sciences, Pleasantville, N. Y., 8p., 1971. (Presented at the Institute for Management Sciences, Annual Meeting, Detroit, Mich., Sept. 29-Oct. 2, 1971.)*

If we are to protect our vital natural resources, improve air and water quality, and control other sources of environmental pollution, large numbers of trained, qualified people are needed to plan and implement control programs at the Federal, State, and local levels of government. Manpower needs of control agencies are defined, as well as occupational categories needed, sources of manpower, training opportunities, and salary ranges for environmental health manpower. (Author abstract modified)

23959 APTIC NO. 42355

Easterbrook, J. L.

AIR POLLUTION CONTROL PROGRESS IN SOUTH AFRICA. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 14-16. (Dec. 6-11, Paper SU 6H.)*

As a result of the 1952 London fog and agitation in Los Angeles over a blue haze which caused migraine and lachrymation, the Council of Scientific and Industrial Research in South Africa decided in 1955 to start research on air pollution and its causes. Its main objective was to study the incidence of pollution in South African cities and to assess the nature of the pollutants. Work proceeded slowly until 1960 when, at a conference organized by the Council of Scientific and Industrial Research, an Air Pollution Research Group was formed as well as a research fund supported by a number of industries and local authorities. In 1965,Act No. 45 was promulgated which provided for the prevention of pollution of the atmosphere, together with the establishment of a National Air Pollution Advisory Committee, the appointment of a Chief Air Pollution Prevention Officer, and other incidental matters. Some aspects of this Act are considered, as well as the monitoring of smoke and sulfur dioxide and objectives of the National Association for Clean Air. Attitudes of the public toward pollution control are also mentioned.

23960 APTIC NO. 43220

Friberger, Tomas

URBAN PLANNING POLICY IN RESPECT OF AIR POLLUTION AND NOISE PROBLEMS. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 7:46 to 7:55. (Sept. 1-6.)*

Means available in Sweden for urban policy planning at different levels of decision making are discussed. The means include the general quality requirements or standards which a society wishes to lay down, the methods and processes through which measures are carried out, and technical measures which may be resorted to in order to achieve the desired environmental quality. Existing quality standards referring to air and sound in relation to decision level and penetration and the national bodies empowered to formulate and enforce them are described. The task at the regional level consists mainly of disseminating information on the application of the national standards and of following their application via scrutiny in conjunction with their approval. The Board of Urban Planning through the medium of its advisory activity regarding both qualities and planning methods, aims at providing local authorities with a better basis for the reinforcement of goals policy and programming for both outline and detailed development planning. At present, the public has very little scope for influencing choice of quality in connection with urban planning. An example of the administrative processes involved in urban planning with regard to air and noise pollution is presented. Technical measures for control of air and noise pollution from buildings and traffic are evaluated with regard to general effectiveness, cost, ease of implementation, and possible side effects.

23961 APTIC NO. 42882

Gallienne, G.

POLLUTION FROM AUTOMOBILES AND ITS PREVENTION. *(La pollution due aux automobiles et sa prevention). Text in French. Pollut. Atmos. (Paris), 14(54):155-156, April-June 1972.*

Current problems of automobile-generated air pollution and its prevention in France are outlined. Coordination of different associations engaged in air pollution control studies as well as close collaboration with the automobile and petroleum industries have been reached. Air pollution measurements have been carried out in Paris by means of a mobile laboratory, and nonobligatory exhaust emission tests have been introduced throughout France. Automotive emission levels in France are well below those in other highly developed countries, and the automobile has maintained its positive role despite its polluting effect. Although Paris traffic increased by 56% from 1963 to 1971, carbon monoxide emissions are 40% lower than in 1967. Cars with reduced exhaust emissions have been launched, and adequate steps in traffic planning such as closing streets with poor ventilation, synchronizing traffic lights, and traffic decentralization have been and continue to be taken.

23962 APTIC NO. 42996

Gilliland, J. L.

THE FEDERAL LAW ON AIR POLLUTION CONTROL. II. *IEEE (Inst. Elec. Electron. Engrs.) Trans. Ind. Appl., 8(1):10-13, Jan.-Feb. 1972.*

For much of 1970, subcommittees of both houses of Congress held hearings and drafted proposed legislation to revise the Clean Air Act of 1967. This bill, the Clean Air Act Amendments of 1970, is now the law of the land. A large part of it is devoted to tightening the pollution controls on moving vehicles. The provisions of the law which apply to the control of stationary sources are considered. Air quality control regions, criteria and control information, national ambient air quality standards, national emission standards for hazardous air pollutants, and implementation plans are discussed. New stationary sources are indicated. Inspections, monitoring, and entry are mentioned, as well as federal enforcement, emergency powers, citizen suits, mandatory licensing, and noise pollution.

23963 APTIC NO. 42844

Haarhoff, Frank E.

POLLUTION ABROAD: WHAT OTHERS ARE DOING TO CLEAN UP THE ENVIRONMENT. *Factory, 5(7):38-40, July 1972.*

In most countries, pollution regulations and standards are still evolving while the question of cost sharing remains unsettled and controversial. Few, if any, countries are as heavily polluted as Japan. About 70% of Japanese companies fail to process their waste output of 58 million tons a year. Almost 100 people have died and more than 6000 have become sick from pollution-related diseases since 1969. In 1971, the Japanese government created the Environmental Agency, but so far the emphasis is on testing and studying the problem. Nevertheless, pollution is now a criminal offense, and violators can be fined and imprisoned for up to three years. Although impressive progress has been made in reducing air and water pollution in the Saarland and Ruhr industrial areas, West Germany also has formidable pollution problems. Alarmed, the Bonn government a few months ago started a comprehensive environmental protection program with new laws and standards. The fight against water pollution in France, the lack of good legislation in Italy, the provision of subsidies and incentives in Sweden, and the Clean Air Act in Britain are considered.

23964 APTIC NO. 43207

Harrison, Paul R.

PLANNING FOR EMERGENCY ACTION FOR AIR POLLUTION ALERTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1972. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-134.)*

Control of emission sources in times of high air pollution readings accompanied by stagnation requires the most efficient reaction procedure within a relatively short period of time. In Chicago the shortest preparation and reaction times are four hours. To facilitate the effective control of emissions under such severe time requirements the City of Chicago has developed a grid system based upon emission inventories, source location, and telemetered sampling sites. From this concept an indexing system has been developed which is computer compatible. Systems of verification and notification have been developed to relieve the episode strategy team of dealing with too much detail in such a small period of time. This has been accomplished in two ways. The first is to require the large emitters to submit episode action plans which are reviewed and approved after satisfactory revisions. The second is to have pre-written strategy packs ready for distribution at the time of imminent alerts. These packs are check lists in logical sequence with detailed but brief instructions of what to do and what to say. The system is expandable and easily modified to suit the needs of smaller control agencies with less personnel and fewer sources. (Author abstract modified)

23965 APTIC NO. 42810

Hashimoto, H.

APPROACHES TO AIR POLLUTION AS INTEGRAL PARTS OF ENVIRONMENT PROBLEMS AND POLICY BY OECD. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1341-1342. (Dec. 6-11, Paper P2 D.)*

The Organization for Economic Cooperation and Development (OECD), an intergovernmental organization with 22 member states, has been instrumental in the formulation of economic policy and the quality of life, in terms of a livable environment as well as social welfare. With a view to incorporating environmental considerations into economic policy, the Environment Committee within the OECD consists of senior governmental officials with central responsibilities for environmental questions. Prior to the formation of this committee, an air management research group (AMRG) was organized to deal with abatement technology, measurement of air pollution, and effects of air pollution. Results of the abatement technology research indicated priorities in industrialized countries in relation to the automobile, fuel combustion, fluorides, and odors. The measurement panel studied the emerging administrative requirements, examined the present measurement capabilities in member countries, and showed principal areas of deficiency in technical capability in regards to air pollution modelling. Examining research in relation to the technical information needed for administrative decisions in abatement of air pollution, the effects panel defined the categories of health effects, economic consequences, and amenity and long term biological and physical effects. Recommendations of the AMRG include: cost-effectiveness studies of available technology transmission and transformation of air pollutants, research on effects of air pollution, and the implementation of a plan for a project on mass transport of air pollution.

23966 APTIC NO. 43632

Hawthorn, Gary C., Peggy A. Reichert, Ronald A. Venezia, and David S. Kircher

THE FUTURE TRANSPORTATION AND AIR QUALITY LEGISLATIVE INTERFACE. *(Presented at the International Conference on Transportation and the Environment, Washington, D. C., May 31, 1972.)*

Air quality legislation is a significant force that can shape future urban transportation systems. Present and future air quality implementation plans, containing transportation controls needed to achieve and maintain air quality standards, promise to alter the short and long-term complexion of metropolitan transportation operations. A case is made for the necessity of contingency transportation planning controls in the event that the exhaust control device does not live up to expectations. Short-term controls such as improvement in traffic flow are quickly nullified by increased traffic volume. Mass transportation must be enormously improved; Americans must be required to change their commuting habits. (Author abstract modified)

23967 APTIC NO. 42809

Humberto, Bravo A.

ASOCIACION MEXICANA CONTRA LA CONTAMINACION DEL AGUA Y DEL AIR- MEXICO. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr, 2nd, Washington, D. C., 1970, p. 1319. (Dec. 6-11, Paper PIC.)*

Founded in 1965, the Asociacion Mexicana contra la Contaminacion del Agua y del Aire consists of approximately 65 members and publishes a quarterly bulletin. Air pollution is problematic in Mexican industrial cities due to unplanned source control, insufficient legislation stressing technological aspects, disinterest by previous government officials, and topographic and micrometeorological conditions.

23968 APTIC NO. 43695

Jacquinot, Pierre

HEATING EQUIPMENT SURVEILLANCE. *(Surveillance des installations thermiques). Text in French. In: Etudes de Pollution Atmospherique a Paris et dans les Departements Peripheriques en 1970. Prefecture de Police, Paris (France), Lab. Central, p. VIII- 3 to VIII-7, April 1971.*

The heating equipment surveillance program of the Paris Police Headquarters Central Laboratory is outlined. Emissions from heating equipment used in household, institutions and small-scale industry contain sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons, soot, solid fuel particles, ash and coke. Both fuel and combustion quality as well as equipment maintenance are covered by the surveillance program which also includes distributing systematic information the public and the detection of possible emission sources. Pressure conditions in nozzles and combustion chamber as well as combustion gas and ambient temperatures are measured and carbon dioxide content is determined in the course of boiler inspections. Some 10% of the 630 boilers inspected during the winter of 1970/1971 caused excessive emissions due to improper or neglected maintenance.

23969 APTIC NO. 42774

Jensen, D. A.

STATUS OF AIR POLLUTION CONTROL IN NORTH AMERICA END OF THE YEAR, 1970. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1313-1317. (Dec. 6-11, Paper PI A.)*

The objectives, problems, administration, status, and some techniques being used in the air pollution control programs of North America are discussed. The U. S. Government handles air pollution questions through the Federal Environmental Protection Agency, while Canadian air pollution control is exercised primarily at the provincial and municipal levels of government. By 1971, approximately 90 air quality control regions in the U. S. were established to set air quality standards based on air quality criteria, the most realistic bases available for determining to what point pollution must be reduced for public health and welfare protection. Air quality standards must include a statement of upper limit ambient concentration and specify the averaging period associated with the stated concentration and measurement method to be used. Important areas highlighted in the discussion are photochemical smog, the original air pollution problem; climatic modifications, at local and global levels; mobile and stationary source regulations and control systems, particularly for automotive emissions and particulate emissions from power plants; and, fuel substitution for stationary and mobile sources. It is concluded that a high degree of cooperation will be required to define, reach, and maintain an air quality objective. Also, status quo inertia has largely been overcome and large amounts of talent and resources are being devoted to the problem.

23970 APTIC NO. 42342

Katz, Milton

DECISION-MAKING IN THE PRODUCTION OF POWER. *Sci. Am., 224(3): 25, 191-200, 246, Sept. 1971. 5 refs.*

Using the power industry as an example, the problems confronting decision-makers, who are forced to compare and choose between the technological and environmental benefits created by various industries, are discussed. The decision-makers include private companies, all levels of governmental regulatory agencies, commercial banks, and appropriations committees for governmental agencies. A method of reconciling the human needs for energy and production with the finiteness of the earth is given. It is suggested that the harmful environmental effects caused by an industry be considered part of its internal operational costs. If the company were to improve its operational processes and thereby eliminate harmful environmental effects or improve the environment in some way, the company would be reimbursed since its social or environmental operational costs would be reduced. The legal system could help to foster internalization of environmental costs through taxation, regulatory statutes, and private civil actions at law. A successful tort action could lead to a judgment for damages or an injunction against the defendant company.

23971 APTIC NO. 43653

Krier, James E.

ENVIRONMENTAL WATCHDOGS: SOME LESSONS FROM A STUDY COUNCIL. *Stanford Law Rev., vol. 23:623-675, April 1971. 259 refs.*

During its initial year, the Environmental Quality Study Council of California developed institutional roles rather than the study role contemplated by the legislature. The EQSC functioned most clearly as an ombudsman. It acted also as a zealous advocate for environmental interests. The clash between these two positions of neutral investigator and zealous advocate weakened the position of the Council to some extent in each role. For example, the advocate role dominated the Palmdale airport construction hearing and resulted in denunciations of the Council as a kangaroo court. Factors influencing the unusually activist orientation of the council are considered. A general discussion of the problems encountered in the creation and functioning of government watchdog institutions is presented. The role of the EQSC as a catalyst of collective public action is described.

23972 APTIC NO. 42808

Ludwig, John H. and Nancy S. Myers

THE NATIONAL AIR POLLUTION CONTROL ADMINISTRATION S PARTICIPATION IN INTERNATIONAL GROUPS. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D.C., 1970, p. 1284-1287. 3 refs. (Dec. 6-11, Paper AD 42A.)*

Since the establishment of the Federal air pollution programs in the U. S. in 1955, the international activities of the National Air Pollution Control Administration (NAPCA) have been expanded to encompass an increasing number of cooperative activities. The general philosophy guiding NAPCA s ability to participate in international activities stems from a desire to be aware of the full range of worldwide activities on all facets of air pollution control programs, the desire to share mutual problems and experiences, and a desire to optimize NAPCA s activities in air pollution control through direct collaboration on the full range of studies needed to define the effects of air pollutants and their control. International activities of NAPCA are classified into the following areas: participation in activities of international organizations, participation in bilateral agreements between the U. S. and other countries, support for research under the U. S. Government special foreign currency program, agreements to exchange research information, contract support in foreign countries for research or for developing other types of information of mutual interest, and collaboration in research activities. NAPCA s involvement in each of these areas, in the context of the general nature of the activity of special groups or the objectives of international cooperative projects, is outlined.

23973 APTIC NO. 42608

Matthews, William H.

BEYOND THE 1972 U.N. CONFERENCE ON THE HUMAN ENVIRONMENT: CHALLENGES AND OPPORTUNITIES FOR THE SCIENTIFIC COMMUNITY. *J. Environ. Sci., 15(3):10-14, May-June 1972. (Presented at the Institute of Environmental Sciences, Annual Meeting, 18th, New York, May 3, 1972.)*

In an environmental action plan to be submitted to the U. N. Conference On the Human Environment, the emphasis at the international level is on assessment -- research, monitoring, and information exchange -- and not on international control and regulation. In many areas consensus on assessment rather than on political action has developed wbecause the policymakers were not aware of much of the scientific and technical work that has already been successfully completed. Implementation of most specific components of the action plan would be largely possible through the programs and activities of existing national and international organizations. However, there is a need for the establishment of new machinery within the United Nations to provide a central point for leadership and coordination of international activities.

23974 APTIC NO. 43187

Middleton, John T.

AIR POLLUTION CONTROL IN THE SEVENTIES. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 1:5 to 1:34. (Sept. 1-6.)*

In the United States, it is estimated that about half of all air pollutants are produced as a result of the transportation system, chiefly the internal combustion engine. The burning of fuel in stationary structures accounts for about 1/4 of the total 1/6 from industrial sources, and 1/6 from municipal incineration and other miscellaneous sources. National primary and secondary ambient air quality standards for carbon monoxide, hydrocarbons, nitrogen dioxide, particulate matter, photochemcial oxidants, and sulfur oxides are presented. By January 30, 1972, each state is required to adopt and submit a plan which provides for the implementation, maintenance, and enforcement of the national air quality standards. To be effective, the plans must contain legally enforceable emission limitations, schedules, and timetables for compliance with such limitations. In addition to the control procedures contained in the implementation plans, the EPA is authorized to establish standards of performance for new stationary sources and modified existing sources that either contribute new or increased pollutant emissions. The task of relating air quality standards to the design of emission controls to achieve the standards is a function of simulation modeling involving sophisticated use of computers and plotting techniques. Current and anticipated vehicle pollution control measures are presented. Among alternative control strategies are land-use regulation and management, taxation, transportation controls, development of an environmentally effective transportation system, and fuel modifications. The issue of power plant control hinges, in the short term, on the development of wise energy policy for the nation.

23975 APTIC NO. 43153

Ohira, Toshio and Isao Koyama

SEVERAL OBSERVATIONS ON FACTORY WASTE GASES. *(Kojo haigasu ni kansuru 2-3 no kosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):83, 1969. (Presented at the Japan Society of Air Pollution, Annual Meeting 10th, Tokyo, Japan, 1969, Paper 82.)*

Some guidelines for monitoring factory flue gases are given. An inspection team, rather than an individual expert inspector, is recommended. Measurements should be taken swiftly and accurately, in order to avoid the transformation of gas consistency. A team should consist of five to eight persons, composed of one leader (a supervisor or an analyst for each measuring point), one or two liaison men, and one emission source informant, and each member should be able to act at a leader if necessary. The establishment of accident treatment standards in various prefectures is necessary.

23976 APTIC NO. 42917

Pickford, Stewart G.

SOME INTERACTIONS OF OPEN BURNING REGULATIONS WITH FIRE CONTROL PLANS AND FORESTRY OPERATIONS. *Preprint, Combustion Institute, Western States Section, 16p., 1972. 8 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-12.)*

A simple model which relates the effects of prescribed burning to air pollutant emission regulations is presented. The model assumes that smoke from wildfires and prescribed burns are indistinguishable; the objective of emission control legislation is to minimize the number of objectionable smoky days in urban centers; fuel modification reduces the number of smoky days due to wildfire; resources for fire control are limited and optimally allocated; prescribed burning causes smoky days in proportion to the area treated; and prescribed burning is the cheapest means of fuel modification. The model shows that the level of fire protection achieved with prescribed burning would cost more if a complete burning ban were imposed; use of the prescribed burning would not decrease the number of smoky days. In applying the model to a real situation, however, a burning ban might be self-defeating if all fire control resources were near optimum allocation; a burning ban would have correspondingly smaller effects if prescribed burning were not applied judiciously, and smoke management plans could significantly reduce smoke problems from both wildfires and from prescribed burning, but only if prescribed burning is used to best advantage. This model should prove useful in trade-off analyses between the effectiveness of prescribed burning in reducing numbers or acreages of wildfire and acreages treated by prescribed fire, since air quality constraints may be incorporated into the analysis.

23977 APTIC NO. 42896

Ruckelshaus, William D.

ENVIRONMENTAL PROTECTION AGENCY. (40 CFR PART 52). NATIONAL AMBIENT AIR QUALITY STANDARDS. APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. *Federal Register, 37(145):15094-15113, July 27, 1972.*

Regulations proposed for 12 of the 25 states which had plans with disapproved portions are presented. Some of the regulations set forth procedures for reporting and recordkeeping by source owners and operators and for release of emission data to the public. Proposed regulations provide for the required application of reasonably available control technology to stationary sources of nitrogen oxides. Regulations also include sulfur oxides emission limitations for two major source categories in Western states: nonferrous smelters and power plants. The states included are Arizona, Idaho, Indiana, Illinois, Montana, Nebraska, Nevada, New Mexico, Pennsylvania, Utah, Virginia, and Wisconsin.

23978 APTIC NO. 43218

Ruiz, Jose E.

WASTE DISPOSAL PROBLEMS IN THE PETROCHEMICAL INDUSTRY. *Preprint, American Chemical Society, Washington, D. C., 7p., 1971. (Presented at the American Chemical Society, Metrochem, San Juan, Puerto Rico, April 30-May 3, 1971.)*

The island of Puerto Rico has the advantage of trade winds, whose velocity and regular directional variations contribute to the dispersion of air contaminants, and coastal waters, whose currents aid in the rapid dilution and mixing of liquid wastes. In the past these natural conditions have been a determining factor preventing serious pollution problems. Presently, the recently created Environmental Quality Board has been given powers to preserve this environment through detection of pollution sources and enforcement of all available legislation. With the Air Quality Act of 1967, federal legal guidelines were established and Puerto Rico subsequently classified as an Air Quality Control Region. The petrochemical industry has attempted to comply with governmental standards and regulations by up-dating waste treatment facilities, keeping abreast of pollution control technology, and participating in collective action. Measures have been taken by the petrochemical companies at their plant operations to ensure against gas and particulate emissions to the atmosphere as well as the dumping of liquid wastes into water bodies.

23979 APTIC NO. 42948

Sachs, David Peter and David Mark Rubin

MASS MEDIA AND THE ENVIRONMENT. VOLUME III. A GUIDE TO INFORMATION SOURCES IN THE SAN FRANCISCO BAY AREA. *Standord Univ., Calif., Dept. of Genetics and Stanford Univ., Calif., Dept. of Communication, National Science Foundation Grant GZ-1777, 73p., Sept. 1971.*

This directory is a guide to specific environmental information for the nine counties (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma) known as the San Francisco Bay Area. The entries are divided between two sections. Part I includes the names of persons who figured prominently in research related specifically to the problems of nuclear power plant siting and land use in the south San Francisco Bay Area, and California s water resources. Part II lists names of government agencies and citizen organizations with offices in the Bay Area whose activities and concerns involve them in issues that affect the area s environment. Government listings are alphabetically sited under federal, state, regional, and local (defined here as agencies whose activities do not encompass the entire nine-county Bay Area) headings. Three indices follow Parts I and II.

23980 APTIC NO. 43571

Schaudinischky, L.

SOME UNCONVENTIONAL IDEAS ON TOWN PLANNING (LESS NOISE - LESS AIR POLLUTION - MORE SAFETY). *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 7:81 to 7:91. 3 refs. (Sept. 1-6.)*

A plan for residential housing design and arrangement which switches the emphasis in home design from the streetfront part of the dwelling to the protected rear part is presented. In the new city to be developed, the area would be subdivied into an appropritate number of largely self-sufficient blocks. Each block may be several hundred meters long and wide. A block consists of a certain number of houses, placed side by side in the usual closed formation. Within the buildings, the apartments are so arranged that they extend from the street to the inner court of the complex. Facing the street in each apartment are the service rooms, including bathrooms, lumber rooms, closets, playrooms, and the kitchen. The interior court area of the block which sealed off against the traffic by screening walls that are as thick as the cross-section of an entire house, should be covered with lots of greenery. Adequate foot and bicycle paths should be provided, and subways should be constructed under houses and under roadways, to permit passing from one block to the two adjacent ones.

23981 APTIC NO. 42906

Schroder, J. G. and G. J. Cleary

CONTINENTAL REPORT: AUSTRALIA AND NEW ZEALAND. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1322-1324. (Dec. 6- 11, Paper PIE.)*

The geography, air pollution legislation, and trends in pollutant levels in Australia and New Zealand are described. One of the South Island towns, Christchurch, is experiencing comparatively high smoke density due to the continued use of domestic coal fires. In Auckland, a study has been made of motor vehicle pollution in city traffic, 50,000 vehicles per day, and curbside carbon monoxide above 100 ppm peak and 45 ppm on a 1-hour basis have been measured. In the central volcanic area of New Zealand there has been a rapid buildup of population exposed to hydrogen sulfide from geothermal sources. There have been no improvements in Victoria with respect to dust fall, sulfur dioxide, and smoke density where measurements have been static over the last few years. Dust fall in Melbourne varies generally between 6 and 11 tons/sq mi/mo insoluble solids. Sulfur dioxide on a yearly mean basis varies between 0.5 and 1.5 parts/100 million. The soiling index values vary between 0.1 and 0.4/1000 linear ft for yearly means yet it is agreed by many observers that visibility in the Melbourne metropolitan area has deteriorated during the last few years. Smoke haze measurements in Sydney have remained fairly steady for the last few years. Measurements of dust fall show a gradual long term downward trend in the Sydney/Newcastle/Wollongong conurbation. Grit emissions from coal fired power station boilers have caused heavy local fallout in a number of instances. There has been an increase in SO2 concentrations in industrial areas believed to be due to a swing to the combustion of high sulfur fuel oils in industrial furnaces. The activities of the Clean Air Society of Australia and New Zealand are described.

23982 APTIC NO. 43189

Senew, Michael J.

A SYSTEMS APPROACH TO MANPOWER DEVELOPMENT IN STATE AND LOCAL AIR POLLUTION CONTROL AGENCIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1972. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-146.)*

A rapid expansion of abatement activities in state and local air pollution control agencies requires an objective and systematic approach to manpower training and professional development. The Environmental Protection Agency has instituted a manpower development system designed to maximize the effectiveness of personnel working in air pollution abatement activities. The initial phase in producing a manpower development system is concerned with problem definition, system design, and program planning. In this phase, components or projects that comprise the system are developed. A network analysis of the projects is performed to ensure orderly and efficient implementation of the system. The second phase in developing a manpower system is concerned with building system components, including development of job descriptors, establishment of a manpower information system, task analysis, staffing guides, and training development. The third phase is concerned with system maintenance and updating. Guides describing results of each module in the manpower development system are being developed to air educators and air pollution control officials with program planning and training development. (Author abstract modified)

23983 APTIC NO. 42781

Shimanuki, Kojiro, Rizen Maniwa, Akio Tomita, Kunihiko Hazumi, Tadato Suzuki, and Ko Kagawa

CONSIDERATION ON ENVIRONMENTAL POLLUTION INDEX, E.P.I. *(Kogai keisu ni kansuru ichikosatsu). Text in Japanese. Fukuoka-ken Eisei Kenkyusho Kenkyu*

Hokoku (Rept. Fukuoka Prefect. Inst. Public Health), 19(2):18-29, June 1971. 7 refs.

A new index, known as the Environmental Pollution Index has been developed. The index is based on the complaints against E.P.I. from the public in the administrative community in the year, the income/person in the community in the year, and is expressed/ 10,000 yen/person in the community. By analysing the relationship between E.P.I. for each of 40 prefectures and income/person for the corresponding prefectures, it was noted that the increase of E.P.I. in a community was associated with an increase of income in the community.

23984 APTIC NO. 42856

Stanley, William J.

THE ENGINEER S RESPONSIBILITY IN POLLUTION CONTROL. *Heating, Piping, Air Conditioning, 44(7):65-68, July 1972.*

The most serious challenge that now faces process designers, product designers, consulting engineers, contractors, architects, and consumers is that of closing our production and distribution cycles in an orderly manner. Production systems must be designed to recycle products that they produce or products from other production systems. Most of the technology required to address these problems seriously is now available. The difficult problem is not a change in industrial plant but a change in the social, economic, and political capabilities of our people. The impact of population growth, technology, and urbanization is considered, including the constructive thinking which is required to handle air, water, land, and noise pollution. Changing trends in present- day industrial development are mentioned as well as pollution control laws, pollution abatement, and planning and zoning.

23985 APTIC NO. 43313

Stork, Eric O.

THE CLEAN AIR ACT - WHERE ARE WE? WHERE ARE WE GOING? HOW ARE WE GOING TO GET THERE? Preprint, Society of Automotive Engineers, Inc., New York, 4p., 1972. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 10-14, 1972, Paper 720127.)

The implementation of Title 2 of the Clean Air Act, with special emphasis on the emission standards and test procedures which will apply to 1975 and 1976 light-duty vehicles, is presented. The new test procedure to measure an average car s emissions and the EPA s tests and analysis, including the baseline study of emissions from 1971 cars which became the basis for setting the new standards, are discussed. The complex control systems being designed to meet the 1975 standards are expected to require more maintenance attention than the control systems currently in use. The EPA expects to allow more maintenance on durability vehicles than is allowed by the currently-applicable regulations. Assembly-line testing will be based on average of emissions from produced cars, and will assure that cars with excessively high emissions will not be permitted to be sold; as soon as procedures are established for testing emissions from in-use vehicles, manufacturers will be required to repair at their expense any vehicle that fails such tests, or to recall and repair any class of vehicles that does not conform to applicable standards.

23986 APTIC NO. 43255

Stormont, Dave

AIR POLLUTION CONTROL. *Oil Gas J., 56(7):87-102, Feb. 17, 1958.*

To find out how refiners are approaching the problem of controlling their wastes, and what the costs are, 40 companies which account for 83% of U. S. refining capacity were surveyed. Replies covered 77% of refining capacity. Expenditures are broken down on an area basis as well as for classes of pollutants being controlled. Organization for control is considered, pointing out how management must take a positive stand, and so inform all employees, if any abatement program is to be effective. Trends in regulation are also indicated. Need for air pollution control depends to a great degree on the location of the refinery. Meteorological and topographical conditions in Los Angeles demand that refiners there adopt rigid control measures. This difference in needs also is reflected in the types of pollutants being controlled. On the West Coast, little of the total expenditure is for controlling smoke and particulate matter. On the East Coast, hydrocarbon and sulfur recovery measures account for more than three-fourths of the expenditures. Controlling sulfur compounds accounted for one-third of the total expenditures reported by the 35 companies responding to the survey. Expenditures centering around hydrocarbon recovery measures, smoke and particulate matter control, and odor control are also indicated. In addition to the millions of dollars it is spending to check air pollution, the petroleum industry is investing over $1,000,000 annually for basic research. Projects being sponsored include reactions of hydrocarbons, sources of gaseous carbon materials, plant damage caused by air pollution, effects of meteorologic conditions, and gas chromatographic methods of analysis of automobile exhaust gases.

23987 APTIC NO. 42965

Walde, N.

MEASUREMENTS PERFORMED BY MEANS OF A MOBILE LABORATORY IN STOCKHOLM IN 1968-1969. *(Matningar i Stockholm 1968-1969 med det mobila laboratoriet). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-23, 5p., Sept. 11, 1968.*

Plans for a carbon monoxide measuring program to be carried out from Sept. 1968 till summer 1969 in Stockholm are presented. The measurements aim at determining carbon monoxide-levels at points of high traffic density, as well as the contribution by traffic to the CO concentration. Test periods of at least 3 weeks during fall, winter, spring, and summer each at the four different measuring points are envisaged. The measuring station includes two instruments, one located near a traffic lane at a height of 1.5-2 m, and the other at a traffic-free point at a distance of 50-100 m. The laboratory van will contain instruments for CO and sulfur dioxide measurements, a tape sampler for soot, as well as a high-volume sampler for dust concentration measurements. The necessary meteorological data regarding wind speed and direction will be supplied by the nearest meteorological station.

23988 APTIC NO. 43449

Warner, Arthur F., Raymond F. Bell, and Daniel C. Campbell

NEW YORK STATE AIR RESOURCES TRAINING PROGRAM. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 9p., 1972. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-147.)*

The training program, both academic and in-service, of the New York State Department of Environmental Conservation is described. The relationship is discussed between maintenance of equipment, structures, and facilities, and an analysis is made between the physical property of the organization and its employees. The difference between training and education is discussed. Administration of the training program, background of the personnel in the program, and the amount of time they devote to the training program are discussed. The Department has a program for full-scale and part-time graduate study, as well as part-time undergraduate study. The cooperative undergraduate engineering program was started in the mid-1960 s. Its history, development, and results of the program are explained as well as the financing of the program and the types of jobs performed by the students. A program was developed to assist graduate schools in developing graduate programs for air pollution control training. Other programs in two and four-year schools were developed and given assistance. The nonacademic training, which is considered a necessity for Department employees, are workshops on enforcement, federal courses offered by the Air Pollution Control Office, smoke evaluation courses, and mangement and supervisory courses. A completely new program was developed in 1971 and expanded in 1972 to train the conservation officers who were formerly in the Division of Fish and Game and have been transferred to the Division of Law Enforcement. (Author abstract modified)

23989 APTIC NO. 43500

Weber, Herbert J.

HOW AIR POLLUTION LAWS AFFECT FOUNDRY OPERATION. *Foundry, 87(9): 244, 246-252, Sept. 1959.*

Many regulations being established by communities for air pollution control are unreasonably stringent with regard to foundry operation. Many communities already have adopted or are planning toadopt the ASME Model Smoke Ordinance and applying its regulations to all types of emissions, even though the ordinance was written for fuel-burning appliances only, such as powerhouse boilers. Because the allowable emission provided for by the ordinance is adjusted to 12% carbon dioxide, the ordinance demands excessively low adjusted emission levels from cupola melting operations where fuel is only a small percentage of the charge, and thus CO2 levels are low. Thus a cupola may actually be causing less air pollution than a power stack operating within the limits of the ordinance, and still be required to install additional control equipment. The model smoke law also includes the use of the Ringelmann Chart as the method of measuring the smoke density, but the Ringelmann Chart is completely inaccurate for measuring a nonblack emission. If the Ringelmann Chart is used to measure the opacity of emissions from metal melting operations, most plants could not comply with a code, even though they met the requirements on the emission limitations, unless they installed costly dust collectors. Use of the Chart for evaluating emissions also rules out the use of conventional wet collectors because steam from wet collectors coupled with emission of fines would yield a misleading plume, even though only a small amount of pollution was being emitted. Ordinances with stack temperature adjustments also place an unfair burden on cupola operations. The Oregon Air Pollution Law in which allowable emissions are based upon measured ground level concentrations is impracticel. The Los Angeles and Vancouver ordinances base the amount of allowable emission on process weight/hr for industrial processes not classified as combustion processes.

23990 APTIC NO. 43351

Wiel, Stephen

EVALUATING LOCAL AIR POLLUTION CONTROL ADMINISTRATION EFFECTIVENESS. *J. Air Pollution Control Assoc., 22(6):437-443, June 1972. 37 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., 1971, Paper 71-121.)*

Data were collected on the Los Angeles County Air Pollution Control District and on Los Angeles air pollution and its effects. The information collected was used to define the air pollution control system in terms of inputs to the agency, agency actions and accomplishments, and outputs from the agency. It was further analyzed to determine which parameters of the system could be quantitatively assessed and how. Quantitative measures were normalized to facilitate comparisons between different time periods as well as between cities, regions, states, and nations. Preparations are underway for using these data to assess the severity of the air pollution problem in Los Angeles, to determine the overall effectiveness of the Air Pollution Control District, and to evaluate its administrative operation. (Author abstract modified)

SOCIAL ASPECTS

23991 APTIC NO. 42920

COMMUNITY RELATIONS. *In: Air Pollution Manual. Part I. Evaluation. Detroit, American Industrial Hygiene Assoc., 1960, Chapt. 2, p. 13-15.*

A company is evaluated not only by the quality of its products and the efficiency of its operations, but also by its conduct as an industrial citizen and neighbor. The first rule in being a good neighbor is to take precautions not to become a bad neighbor. This can be done most effectively by careful planning while a new plant is in the blue print stages. Consideration should be given to choice of plant site, raw materials, and controls required for selected sites. A plant already built and in operation should make a realistic appraisal of its emissions, whether or not there are air pollution complaints. Concurrent with the stack sampling work, a study should be made of the meteorology and topography of the area. In addition to gathering factual data concerning type and amounts of pollution discharge and their toxicity and/or effects on the surrounding area, an industry should designate an individual or a department to whom complaints could be referred. Practical suggestions are provided to assist management in investigating complaints.

23992 APTIC NO. 42461

Austin, Arthur L. and John W. Brewer

WORLD POPULATION GROWTH AND RELATED TECHNICAL PROBLEMS. *Technol. Forecasting Social Change, vol. 3:23-49, 1971. 36 refs. (Also: IEEE (Inst. Elec. Electron. Engrs.) Spectrum, 7(12), Dec. 1970.)*

Data are provided on population growth, energy consumption, and life-support capabilities on the global scale as they relate to the U. S. If the present rate of technical growth continues into the future, social systems will become increasingly complex and increasingly more prone to failure. Industrial processes must be redesigned to eliminate waste processes and useless products. A central agency must be established to provide the energy industry with a rational basis for its policy decisions. Research and development of sea farming must be increased, especially as it relates to the harvesting of sea plants. Research and development in the area of energy conversion must increase. Lastly, the establishment of a national center to coordinate the study of the relationship between man, his institutions, and his environment is needed because of the interdisciplinary nature of the problems. (Author summary modified)

23993 APTIC NO. 43451

Brenchley, David L. and John M. Bell

SIMULATION TECHNIQUES IMPROVE ENVIRONMENTAL ENGINEERING EDUCATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1972. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-145.)*

Simulation techniques are being used in six environmental engineering courses at Purdue University. These techniques include classroom role playing, engineering case studies, and computer management games. The simulation activities are used in conjunction with a hypothetical reference community which consists of 200 pages of descriptive information on government, public works, health and welfare, socio-economic conditions, climate, commerce, and industry. In the role playing situations students portray industrialists, politicians, government officials, and citizens. Over 90% of the student participants have indicated that this activity is an effective teaching aid and should be continued. The engineering case studies have received considerable use in a graduate air pollution course in which engineering teams are assigned significant problems in the reference community. The scope is such that the team must spend at least 15 man-hrs/week to solve the problem during the semester. The computer management games are intended to be used to reinforce what students have learned from lectures, discussions, and reading. Three programs known as AQDM, DISCUS, and DOSAG have received use in conjunction with the reference community; AQDM, DISCUS, and DOSAG deal with air quality, solid waste handling, and water quality, respectively. The major benefits of using simulation techniques in the engineering classroom include greater interest and participation, a better understanding of the course material, a greater appreciation for the needs of people from various community sectors, and learning to identify, define, and solve environmental problems in a community context. (Author abstract modified)

23994 APTIC NO. 42462

Forrester, Jay W.

COUNTERINTUITIVE BEHAVIOR OF SOCIAL SYSTEMS. *Technol. Forecasting Social Change, vol. 3:1-22, 1971. 5 refs. (Also: Technol. Rev., 73(3), Jan. 1971.)*

Issues of broad concern in the U. S. are population trends; the quality of urban life; national policy for urban growth; and the unexpected, ineffective, or detrimental results often generated by government programs. At times programs produce exactly the opposite of the desired results. This is probably because our social systems belong to the systems class called multi-loop non-linear systems and are not amenable to ordinary debate- produced compromises. Judgment and debate usually lead to a program that appears sound. If the presumed action actually makes matters worse, the reasons are not often obvious. Increasing commitment to the program actually intensifies the problem. A world model is presented showing the interrelationship of population, capital investment, natural resources, pollution, and the fraction of capital devoted to agriculture. A model like this may be used to guide the transition from a growth to an equilibrium economy. Unless equilibrium is attained by man, the social system will attain its own equilibrium by its own internal and undesirable processes.

23995 APTIC NO. 43222

Settle, Allan E.

PUBLIC OPINION AND COMMUNITY INVOLVEMENT. *J. Air Pollution Control Assoc., 16(9):490-491, Sept. 1966.*

A poll conducted by Opinion Research Corp. in 1965 indicated to the chemical industry that there is substantial public concern with air pollution only in areas where the problem is critical, that industries are considered among the prime villains, and that there is only limited public awareness of industrial efforts to deal with pollution problems and of the economic factors in community pollution control programs. Other surveys have also pointed to rising public concern with industrial pollution, coupled with a lack of understanding of the problem. The chemical industry believes that pollution control programs will be greatly handicapped without wide-spread public understanding and support. (Author abstract)

GENERAL

23996 APTIC NO. 42686

Ministerium fuer Arbeits, Gesundheit and Soziales des Landes Nordrhein-Westfalen, Duesseldorf (West Germany)

PROBLEM NUMBER 1: THE ALTERED ENVIRONMENT. *(Gestoerte Umwelt - das Problem Nr. 1). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit. Moehnesee-Wamel, West Germany, K. von Saint-George, 1972, p. 7-13.*

General problems of environmental pollution are outlined. While the rate of population growth from 1950 to 1970 was 20%, energy consumption rose by 300%, electricity production by 500%, and expansions of paper manufacturing by 400%. The rapid industrial growth took place at the expense of nature and environment, causing air and water pollution and other problems. Some 4 million tons of dust and soot, 8 million tons of carbon monoxide, 4 million tons of sulfur dioxide, as well as 2 million tons of hydrocarbons and nitrogen oxides each, are discharged yearly to the atmosphere in West Germany. Air pollution affects man, animals, vegetation, and buildings. The radioactive contamination due to nuclear power plants and other facilities is negligible in comparison with the natural background. A survey revealed that a large proportion of people who had left the Ruhr area did so on account of polluted air. An abatement of air pollution as a result of improved technologies and the intensive use of pollution-control techniques has been apparent for the last years. A clean-air maintenance program has been elaborated for North Rhine-Westphalia.

23997 APTIC NO. 43184

DeMartini, F. E.

THE SIGNIFICANCE OF PARTICULATE EMISSIONS IN COMMUNITY AIR POLLUTION. *Particulate Emission, Proc. Symp. Air Pollution, Philadelphia, 1957, p. 3-20. 2 refs.*

The six major effects of particulate pollutants are reduced visibility, soiling of structures and materials, increased rate of deterioration and corrosion of materials, irritation of mucous membranes, potential or actual health effects, and plant damage. The type of aerosol emitted by specific operations in the following categories of particulate sources is noted: chemical and allied products, combustion, food products, petroleum, metallurgical and metal, and mineral earth processing. Equipment for control of particulate emissions can be divided into four general categories: inertial collectors, cloth filters, electrical precipitators, and wet collectors or scrubbers. Frequency distributions of particulates and organic levels in several urban and nonurban areas of the U. S. are given, as recorded in the National Air Sampling Network. The maximum metal levels observed and the cities where they occurred are presented for 13 metals. Particulate research programs are reviewed with respect to the kinds of research organizations involved, the nature of the research being carried on, and the sources research support.

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